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Percentage of phonological process usage in expressive language delayed children

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Language delay and phonological delay have been shown to coexist. Because they so often co-occur, it is possible that they may interact, sharing a relationship during the child's development. A group of children who were "late talkers" as toddlers, achieved normal development in their syntactic ability by the preschool period. Because their language abilities are known to have increased rapidly, data on their phonological development

could provide information on the relationship between phonological and syntactic development.

The purpose of this study was to compare the percentage of phonological process usage of the eight most commonly used simplification processes in four-year-old expressive language delayed (ELD) children, children with a history of slow expressive language development (HX), and normally developing (ND) children. The questions this study sought to answer were: do ELD children exhibit a higher percentage of phonological process usage than ND children, and are HX children significantly different in their percentage of phonological process usage than ND and/or ELD children.

Children from the Portland Language Development Project, a longitudinal study of language development in late talkers, were grouped according to the Language Development Survey (Rescorla, 1989) at 20 months and their Developmental Sentence Score (Lee, 1974) at 4 years. Language samples, collected at age 4, containing 90 different words each from 10 ELD, 10 HX, and 10 ND children were phonemically transcribed and input onto the Programs to Examine Phonetic and Phonologic Evaluation Records (Shriberg, 1986) for analysis.

In answering the questions posed, results of ANOVA and Tukey multiple comparison procedures indicated that the ELD subjects used a signficantly higher percentage of

cluster reduction than the ND subjects. No other significant differences were found, although several processes were used substantially more frequently by ELD and HX children than by ND children.

These results suggested that ELD children are delayed in their phonological process suppression of cluster reduction only. HX children, while not significantly different from the ELD or ND children in their percentage of phonological process usage, appeared to fall somewhere between the two groups in their ability to suppress cluster reduction.

The results were analyzed further to determine if avoidance or unintelligibility effected the percentage of usage means results. It was concluded that avoidance of sounds or syllable structures did not affect process usage in either the ELD or HX groups. Significant differences were found, though, between the ND and HX groups and between the ND and ELD groups in the percentage of unintelligible words found in the language samples. Had more words in the HX and ELD samples been transcribable, more phonological processes may have been identified and a greater disparity between the ELD or HX groups and the ND group might have been found.

PERCENTAGE OF PHONOLOGICAL PROCESS USAGE IN EXPRESSIVE LANGUAGE DELAYED CHILDREN

by

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CHAPTER I

INTRODUCTION

In the past, children requiring special communication services were categorized into one of two groups. Speech delayed children were those with articulation errors such as substitutions and omissions occurring on specific sounds. Language delayed children were those with syntactic or semantic errors. More recently a third category has been added called phonologically delayed. This label includes children with deficits in their production of phoneme classes (i.e., changing palatals -> stops) and syllable structure (i.e., use of open CV syllables only) (Shriberg & Kwiatkowski, 1988). These three categories of communicative disabilities have not been found to be mutually exclusive in children. On the contrary, they have often been found to co-occur (Fey & Stalker, 1986; Paul & Jennings, in press; Paul & Shriberg, 1982; Schwartz, Leonard, Folger, & Wilcox, 1980).

Because these delays are found to coexist in children so frequently, research has been done in the past decade to determine what type of relationship exists among these three delay types. These studies include

language delayed and speech delayed children. Schmauch, Panagos, and Klich (1978) have indicated that increasing syntactic complexity caused language disordered children to be more likely to misarticulate a target consonant. Paul and Shriberg (1982) found that 50 percent of the speech delayed children in their study scored lower in their production of complex morphophonemes than their syntactic ability indicated they were capable of scoring. Thus, in half of the children, phonological limitations decreased the expression of syntactic complexity. These studies show that not only do language delay and phonological delay often coexist, but they may interact, sharing a relationship during the child's development.

Bishop and Edmundson (1987) developed a hypothesis explaining this interaction. They believed that phonology and expressive language do not draw on separate disabilities, but rather reflect hierarchy of vulnerability of functions within the language system. They set forth that as a delayed child matures in language function and begins to "catch up" to normal peers, the order in which functions will approach normal levels can be predicted. More specifically, they suggested that expressive syntax will recover before phonology, reflecting the fact that expressive syntax, though less vulnerable than receptive skill, is more buffered from disruption than is phonology (see Figure 1).

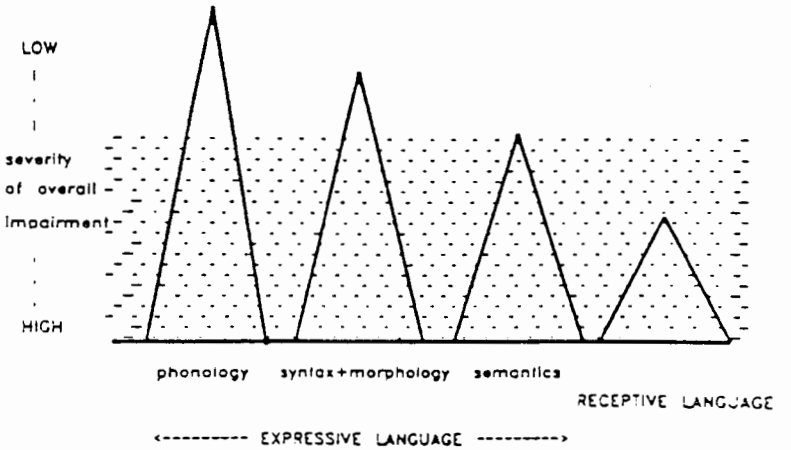

Figure 1. "Submerged mountains" analogy to specific language impairment (from Bishop and Edmundson, 1987).

Shriberg and Kwiatkowski (1988) and Schwartz et al. (1980) have suggested that existence of a relationship between these delays should affect the approach taken to clinical treatment. Instead of treating each delay individually, a more comprehensive approach, emphasizing growth across all delayed modalities, is warranted. Before this can happen, more information is needed to clarify the relationship among delay types.

Data on how phonological and language development interact may be acquired by studying a special group of children. These children are those who were "late talkers" as toddlers, but who in the preschool period achieved normal development in their expressive language abilities. Since their language abilities are known to

have increased rapidly, investigating their phonological abilities would yield information about the relationship between phonological and linguistic development.

STATEMENT OF PURPOSE

The purpose of this study was to determine how normally developing (ND) preschool children, preschoolers with expressive language delay (ELD), and preschoolers with a history of slow expressive language development as toddlers but currently normal syntactic levels (HX) differ in their phonological process usage.

The questions this study sought to answer were:

(1) Do expressive language delayed children exhibit a higher percentage of phonological processes than normal children?

(2) Are children with a history of slow expressive language development significantly different in their percentage of phonological process usage than normal and/or language delayed children?

It is hypothesized that language and phonology do relate in their development. If this hypothesis is correct, this relation will be seen in four-year-old ELD children using a significantly higher percentage of phonological processes than four-year-old ND children. In addition, four-year-old HX children are also hypothesized to use a significantly higher percentage of phonological processes than ND children, reflecting the

remnants of their delay, as the Bishop and Edmundson (1987) model predicts. Conversely, if language ability does not influence phonological process development, then no differences would be found among the three groups.

DEFINITION OF TERMS

Expressive Language Delayed (ELD) Subjects. Children who at 20 to 34 months were expressing less than 50 words and who, at 4 years old, fell below the 10th percentile on their Developmental Sentence Score (DSS).

Subjects With a History of Slow Expressive Language Development (HX). These children were diagnosed as late talkers at two years by the above criteria but showed normal expressive language ability as indexed by DSS at age four.

Normally Developing (ND) Subjects. Children who at 20 to 34 months displayed an expressive vocabulary of more than 50 words and who, at 4 years old, scored above the 10th percentile on the DSS.

Developmental Sentence Score. The DSS analyzes 50 utterances containing both a subject and a verb from a speech sample. Points are awarded to each utterance based on eight grammatical categories with the earlier developing categories receiving fewer points than later

developing categories. A normal four-year-old DSS range is approximately 5.75 to 9.0 (Lee, 1974).

Phonological Simplification Processes. The phonetic/phonemic changes in speech that occur regularly for classes of sounds or syllable structures, not just for individual phonemes (Hodson & Paden, 1981).

CHAPTER II

REVIEW OF THE LITERATURE

Phonological ability develops in tandem with semantic and syntactic skill between the time a child speaks his first word through his preschool years. The process of acquiring intelligible speech is extremely dynamic, yet somewhat predictable. This study analyzes the phonological ability of normal and expressive language delayed children. Thus, a review of the literature regarding the phonetic and phonological development of normal children from one through four years of age will be presented. Because it is expected that the language delayed children may exhibit delayed phonological skills, literature pertaining to phonological disorders will be discussed briefly. In addition, literature describing phonological ability in language delayed children will also be reviewed.

SPEECH SOUND DEVELOPMENT

Phonetic Development

The acquisition of phonemes is highly variable in young children but becomes more predictable as children

age (Stoel-Gammon, in press). Studies have been carried out and charts created on the order in which phonemes are mastered (see Grunwell, 1982; Olmsted, 1971; Sanders, 1972; Templin, 1957). However, these studies have also shown a wide range of variability to occur with some sounds having an acquisition range as large as three years (Owens, 1984).

While these studies show the general trends in development, Weiss, Gordon, and Lillywhite (1987) point out that acquisition of phonemes is a gradual process with individual sounds being produced correctly and incorrectly, depending on the word in which they occur. In addition, sounds produced correctly at an early age may later be produced incorrectly.

Owens (1984), Stoel-Gammon (in press), and Weiss, Gordon, and Lillywhite (1987) reported that some general predictions can be made about the order of acquisition in young children when phonemes are grouped into classes. While a general sequence of mastery can be specified, the exact ages have not been determined. A compilation of their findings is as follows:

1. Vowels usually develop before consonants with a correct production rate of almost 100 percent by 3 years old.

2. Stops, nasals, and glides are acquired before liquids, affricates, and fricatives.

3. When consonants are grouped according to place, the order is usually glottal, then labials, velars, alveolars, dentals, and finally palatals.

4. Most phonemes are mastered in the initial position before the final position, although rapid development of correct final consonant production occurs between the ages of two and three years. Fricatives are an exception and often emerge first in the final position.

5. Single consonants are mastered before clusters, which are not fully mastered until very late (seven to eight years). However some clusters may begin to appear as early as age two years (Stoel-Gammon, 1987).

From these sources it can be determined that a normal four year old will produce all his vowels correctly, have stops, nasals, and glides mastered, use correct production of many consonants in the initial and final positions, and be using some clusters, while simplifying others.

Phonological Development

A description of the development of syllable structure is agreed upon by most authors (Owens, 1984). First words are usually made of one or two syllables taking the form of CV, VC, or CVCV-reduplicated (Weiss, Gordon, & Lillywhite, 1987). By age two CVC, CVCV-non-reduplicated, CVCVC, and a few initial and final clusters (CCV-, -VCC) have been added. As the child grows, his syllable types become less limited (Stoel-Gammon, in press). Thus a

normal four year old will be using a variety of syllable shapes including CV, VC, CVCV, CVC, CVCVC, CCV-, and -VCC.

Phonological processes are strategies children use in order to try to approximate the adult form of the word they hear. These strategies appear to simplify the production of the target word, probably making it less difficult to articulate in some way. Many phonological processes are considered normal in the speech of children under the age of four, based on the high percentage of normal children who use them. However, other phonological processes are considered unusual as a result of their infrequent appearance or persistence in delayed children beyond the developmental period (Weiss, Gordon, & Lillywhite, 1987).

Weiss, Gordon, and Lillywhite (1987) divide processes into three categories: syllable structure, assimilation, and substitution. The syllable structure processes are those which simplify the syllable structure of the adult form. Three syllable structure processes frequently used by preschool children (Shriberg & Kwiatkowski, 1980) include:

1. Cluster reduction--the whole cluster or consonant blend is omitted or one of the consonants in the cluster is omitted or substituted.

   /pleɪ/ -> /eɪ/
   /pleɪ/ -> /peɪ/
   /pleɪ/ -> /pweɪ/

2. Final consonant deletion--the final consonant of a word is omitted to change a CVC to a CV syllable.

   /bot/ -> /bo/

3. Unstressed syllable deletion--the weak syllable of a multi-syllablic word is omitted.

   /poteto/ -> /teto/

Assimilation processes are those which make one sound or syllable more like another sound or syllable in a word. Both progressive and regressive assimilation are quite common in normal development (Shriberg & Kwiatkowski, 1980). Progressive assimilation occurs when a sound/syllable becomes more like a preceding sound/ syllable (i.e., /dag/ -> /dad/). Regressive assimilation occurs when a sound/syllable is influenced by a later sound (i.e., /dag/ -> /gag/).

Substitution processes are those in which a phoneme is replaced by another phoneme without regard to its phonetic context. Four commonly used substitution processes (Shribery & Kwiatkowski, 1980) are:

1. Stopping--fricatives, affricates, liquids, and glides are replaced by stops.

   /kɪs/ -> /kɪt/

2. Palatal fronting (sometimes may also be called depalatalization)--palatal is replaced by an anteriorly produced phoneme.

   /ʃap/ -> /sap/

3. Velar fronting--velar is replaced by an anteriorly produced phoneme.

   /kʌp/ -> /tʌp/

4. Liquid simplification--liquid is substituted by simpler phoneme (often a glide).

   /lid/ -> /wid/

Eight processes are reported by Shriberg and Kwiatkowski (1980) to be the most common phonological processes used by both normal and speech delayed children. These processes are cluster reduction, final consonant deletion, unstressed syllable deletion, assimilation, stopping, palatal fronting, velar fronting, and liquid simplification. Shriberg and Kwiatkowski (1980) include these processes in their Natural Process Analysis (NPA) and in its computer-assisted version, Programs to Examine Phonetic and Phonologic Evaluation Records (PEPPER). Because of the research documenting their prevalence, and their inclusion in a systematic analysis procedure, these processes were chosen to be investigated in this study.

Phonological Process Development

Many attempts have been made to determine normal children's usage of phonological processes. There are two ways of looking at phonological processes in development. One way is to examine data on the order of "suppression," or discontinuation of use of the processes. The second is to study the percentage of occurrence of each process in normal children at various ages. Each of these approaches yields a standard with which to compare phonology in delayed children.

Order of Suppression. In 1985, Stoel-Gammon and Dunn reported that in normal children some processes disappeared by age three. These processes are unstressed syllable deletion, final consonant deletion, velar fronting, and consonant assimilation. They also concluded that some phonological processes will continue to be used by normal speakers after age three. These include cluster reduction, liquid simplification, stopping, and palatal fronting.

Dyson and Paden (1983) followed 40 normal children's usage of five phonological processes including liquid simplification, cluster reduction, fronting, stopping, and final consonant deletion from two years old to three years, six months old. At the age of two years, each subject exhibited three of the five processes. By the age of three years, the children had stopped using final consonant deletion, and by three years, six months had eliminated stopping and fronting. However, liquid simplification and cluster reduction were found to persist after the age of three years, six months.

Hodson and Paden (1981) looked at 60 normally developing 4-year-old children. When assessed with Hodson's Assessment of Phonological Processes, the results showed the following processes were being used by the corresponding number of normally developing four year olds:

Liquid simplification	(/rɪd/ -> /wɪd/)	40/60	(66%)
Palatal fronting	(/ʃu/ -> /su/)	10/60	(16%)
Assimilations	(/lag/ -> /gag/)	10/60	(16%)

In 1982, Grunwell generated a chart, based on a compilation of data from the research literature, which displayed the ages at which phonological processes are commonly used, found in some children, and normally suppressed. The data which follows indicates the normal age range at which the use of each process nears zero:

2.6 years:	reduplication
3.0 years:	final consonant deletion
	assimilation
3.6 years:	velar fronting
	stopping of fricatives
4.0 years:	unstressed syllable deletion
	cluster reduction
after 4.0:	palatal fronting
	liquid simplification

Ingram (1976) summarized phonological process suppression in normal children as follows:

3.0 years:	final consonant deletion
	stopping
3.6 years:	velar fronting
	palatal fronting
4.0 years:	unstressed syllable deletion
	assimilation
after 4.0:	cluster reduction
	liquid simplification

These studies on the order of suppression of phonological processes in normal children display some variability, yet agree on many aspects. Many studies (Dyson & Paden, 1983; Grunwell, 1982; Ingram, 1976; and Stoel-Gammon & Dunn, 1985) found that final consonant deletion is no longer used by age three and stopping and

velar fronting fade out by three years, six months. Liquid simplification was agreed generally to persist after age four. Cluster reduction was also generally found to continue at least until age four.

Disagreement was found on unstressed syllable deletion with Stoel-Gammon and Dunn (1985) reporting suppression by age three and Grunwell (1982) and Ingram (1976) by age four. Palatal fronting was found to be used after age four in all studies except by Ingram (1976) and Dyson and Paden (1983) who reported suppression by three years, six months. In addition, a wide range of variability on assimilation existed from reports of suppression by three years from Stoel-Gammon and Dunn (1985) and Grunwell (1982), by four years from Ingram (1976), and after four years by Hodson and Paden (1981). The disagreement on assimilation may be due to the wide variety of types of assimilation examined.

From this information, it can be determined that many normal four year olds may still be exhibiting liquid simplification and cluster reduction. Some may also display unstressed syllable deletion, palatal fronting, and/or assimilation. Stopping, final consonant deletion, and velar fronting will not be evident in the speech of normal four year olds.

Percentage of Process Occurrence. Haelsig and Madison (1986) studied 50 normal children between the ages of 3 and 5, at 6 month intervals with 10 subjects in each group, to determine their phonological process usage. Their data showed the percentage that each process was used at three and four years of age as follows:

	Three Years	Four Years
Liquid simplification	48%	24%
Unstressed syllable deletion	38	27
Cluster reduction	30	10
Assimilation	30	14
Final consonant deletion	22	8
Stopping	14	8
Fronting	10	8

Their study agreed with the previously discussed studies on order of suppression of phonological processes as they concluded that unstressed syllable deletion, cluster reduction, assimilation, and liquid simplification are found in normal three year olds. Unstressed syllable deletion and cluster reduction are found to persist beyond four years, six months. Their study clearly demonstrates the gradual rate of suppression of processes in children as the percentage of occurrence slowly declines as the children grow older. The four-year-old percentages provide a standard with which to compare the data to be derived from the present study.

DELAYED PHONOLOGICAL DEVELOPMENT

Phonological Process Usage in Phonologically Delayed Children

Reviewing literature on children with disordered or delayed phonological development will demonstrate what kinds of errors may be expected in language delayed children if their phonological development is also affected.

Ingram discussed the phonology of speech delayed children in his book Phonological Disability in Children (1976). He stated that disordered children differ from normal children in that they do not suppress processes as early as the normal children. In addition, they use more phonological processes and do not use them consistently. They may also use unique and uncommon processes along with the processes found in normal children. Ingram gave an example of an unusual process he called "nasal preference." In this case the child would substitute nasal consonants for orals, especially when initiating a word.

Research has been carried out to determine the specific phonological processes which are being used by language disordered and phonologically disordered children. Shriberg and Kwiatkowski (1980) reviewed the literature on phonological delays at that time and identified eight processes that appeared to be the most

commonly used by both normal and speech delayed children. As mentioned before, they found cluster reduction, velar fronting, palatal fronting, assimilation, stopping, liquid simplification, unstressed syllable deletion, and final consonant deletion to be the most prevalent processes in child speech.

Dunn and Davis (1983) studied the phonological process usage of nine phonologically disorderd children, aged three years, eight months through five years, ten months, and found seven processes occurring most frequently and accounting for 65 percent of all errors. These include assimilation, unstressed syllable deletion, stopping, final consonant deletion, velar fronting, depalatalization (palatal fronting), liquid simplification, and cluster reduction. They concluded that there is a wide range of individual differences in phonologically disordered children and that more research is needed on the phonological abilities of these children.

Stoel-Gammon and Dunn (1985) reviewed the studies available, including Compton (1976), Dunn and Davis (1983), Edwards and Bernhardt (1973), Grunwell (1981), Hodson and Paden (1981), McReynolds and Elbert (1981), Schwartz et al. (1980), and Shriberg and Kwiatkowski (1980), to draw conclusions on phonological development in disordered children. They discovered general trends

among these studies in that they all showed a high usage of cluster reduction, final consonant deletion, unstressed syllable deletion, stopping, velar fronting, palatal fronting, liquid simplification, and assimilation.

In summary, these studies indicate that the difference between normal and disordered phonological development may be the higher usage and longer duration of a relatively small set of processes, specifically, final consonant deletion, stopping, velar fronting, palatal fronting, unstressed syllable deletion, liquid simplification, cluster reduction, assimilation, with some idiosyncratic use by delayed children.

Phonological Process Usage in Language Delayed Children

Children with a language delay have been studied to determine their phonological abilities. As cited previously, Schmauch, Panagos, and Klich (1978) indicated that increasing syntactic complexity increased the probability that language disordered children would misarticulate a target consonant. Paul and Jennings (in press) presented research findings on expressive language-delayed toddlers. Their research suggested that two-year-old children with an expressive language delay also displayed a significantly lower percentage of correct consonant production than normally developing children. In addition, Fey and Stalker (1986) found that a

six-year-old language-impaired child used common phonological processes found in younger, normally developing children as well as unusual phonological processes. Similar findings were reported by Schwartz et al. (1980) when they matched three normally developing children and three language disordered children on MLU, sex, and cognitive development, but not on age. They found no significant differences in these two groups' phonological process usage during spontaneous speech. Thus it appears that language delayed children often exhibit a delayed phonological ability. They use a higher percentage of common and unusual phonological processes than normally developing children of the same age and may use these processes for a longer time.

As stated previously, Bishop and Edmundson (1987) developed a hypothesis on the relationship between linguistic and phonological delay. They believed that phonology and expressive language do not derive from separate disabilities, but rather reflect a hierarchy of vulnerability within a common core of delay. Their analogy, presented in the Introduction, described a set of mountains, each representing a language modality, submerged in water, representing the severity of the impairment. The tallest mountains were breaking the surface while the smaller ones, though still present, were

submerged. Phonology is more vulnerable to impairment than expressive syntax, thus it is represented by a taller mountain. As a child develops, the water line rises, and the child's vulnerability becomes less visible in the mountain areas covered in water (maturation). The pattern of delay is then changed from expressive syntactic delay to the modality higher in the category, phonology. According to this model, it is expected that children with language delays will recover in expressive syntax before they master phonology.

CHAPTER III

METHODS AND PROCEDURES

SUBJECTS

Subjects for the present study include children involved in the Portland Language Development Project (PLDP), a longitudinal study of expressive language delay. Children were recruited from the Portland metropolitan area by means of questionnaires given to parents at well-baby clinics, newspaper articles, and radio announcements. Children were designated late talkers (LTs) if they produced fewer than 50 words at 20 to 34 months, by parent report on the Language Development Survey (LDS) (Rescorla, 1989) (see Appendix B). The LDS is a checklist of 300 of the most common words in children's early vocabularies. Rescorla (1989) reports excellent reliability and validity on the LDS for indexing expressive vocabulary size, as well as good sensitivity and specificity for identifying language delay in toddlers. Children were placed in the normal group if they were reported by parents to produce more than 50 words at 20 to 34 months on the LDS. Dale, Bates, Reznick, and Morriset (1989)

suggest that an expressive vocabulary of less than 50 words at 20 months of age represents a significant delay.

The two groups were matched on the basis of chronological age and were matched as closely as possible for race, sex, and socioeconomic status (SES) (see Table I).

TABLE I

SUMMARY OF DEMOGRAPHIC DATA AT INTAKE

Group	Number	Mean Age in Months +/- S.D. at Intake	SES*	Race	Sex
Late Talker	20	25.4 +/- 3.8	2.5 +/- 1.1	90% White 10% Minority	70% Male 30% Female
Normal	10	26.2 +/- 3.5	2.5 +/- 1.4	90% White 10% Minority	60% Male 40% Female

*SES was based on a four-factor index combining occupation and education status of the parents (Myers & Bean, 1968). Weighted scores were obtained and an overall score from 1 to 5 was derived for each subject (with 1 being the highest SES level).

The late talkers used in the present study consisted of those children from the PLDP for whom data was available at both the intake evaluation (20 to 34 months of age) and at the 4-year-old follow-up evaluation. There were 14 males and 6 females in this group with an approximate mean age of 25 months at intake. The normal group was made up of 6 males and 4 females with an approximate mean age of 26 months at intake. Both the late talker and the

normal group had an SES of approximately 2.5 A one-way ANOVA at the .05 significance level revealed no significant differences between the two groups in terms of their chronological age at intake, proportion of males to females, race, or SES.

PROCEDURES

Procedures at Intake

At the initial assessment at Portland State University, permission forms were signed by parents of each subject.

Screening. Children were included in the PLDP only if they had no known physical handicaps, mental retardation, or other disability which might hinder normal development of language. A psychologist administered either the Bayley Scales of Infant Development (Bayley, 1969) or the Stanford-Binet Intelligence Scale (Terman & Merrill, 1960) to determine each child's intellectual functioning. Children were included in the PLDP only if their standard scores were 85 or higher on these tests. Audiological sound-field screenings were administered with all subjects, except two from the normal group, passing at 25 dB HL. One of the normal subjects passed at 40 dB HL and the other refused to be tested. At the intake assessment, an extensive battery of linguistic and non-linguistic testing took place (see Paul, in press).

Procedures at Follow-Up, Age Four. Subjects were seen at some time between their fourth and fifth birthday for follow-up assessment. The mean age of both the normal and late talker groups at this time was 50 months. A speech sample was collected on audiotape during a free play interaction between each child and his/her mother. This sample was transcribed and a Developmental Sentence Score (Lee, 1974) for each subject was completed based on these samples.

Group Assignments for Current Study. The late talker group identified in the initial phase of the PLDP was divided into two sub-groups on the basis of DSS scores. If at age four years the DSS of a child originally identified as a late talker fell below the 10th percentile, s/he was categorized as expressive language delayed (ELD) at age four. If at age two years a child were diagnosed as a late talker, but at age four years the DSS score fell above the 10th percentile, s/he was categorized as having a history of slow expressive language development and placed in the HX group. Subjects who had previously been in the normal group and scored above the 10th percentile on their DSS continued to participate as normal subjects. Thus, the independent variable of language diagnosis has three levels:

(1) Children with normal expressive language development (ND) throughout their history.

(2) Children with expressive language delay (ELD) as indexed by performance below the 10th percentile on the DSS at age four.

(3) Children who were late talkers at two years but had normal expressive language ability at four years (HX), as indexed by a score above the 10th percentile on the DSS.

The ELD group consisted of 5 males and 5 females (see Table II) with a mean age of approximately 51 months. Nine of the subjects were Caucasian and their SES mean was 2.5.

TABLE II

SUMMARY OF DEMOGRAPHIC DATA AT REASSESSMENT

Group	Number	Mean Age in Months +/- S.D. at Intake	SES	Race	Sex	DSS
ELD	10	51.1 +/- 2.2	2.5 +/- 1.2	90% White 10% Min.	50% M 50% F	4.7 +/- 1.8
HX	10	50.4 +/- 2.6	2.4 +/- 1.0	90% White 10% Min.	90% M 10% F	7.3 +/- 0.7
Normal	10	50.5 +/- 2.8	2.5 +/- 1.4	90% White 10% Min.	60% M 40% F	7.4 +/- 1.4

The HX group was made up of 9 males and 1 female with an approximate mean age of 50 months. One of the subjects was a minority and the remainder were Caucasian. The mean SES was 2.4.

The ND group was made up of the same sex, race, and SES as reported at two years old. At reassessment, their mean age was approximately 50 months.

A one-way ANOVA at the .05 significance level indicated no significant differences between these three groups on age, race, or SES. However, a signficant difference ws found between the ELD and the HX group and between the ND and the HX group on the ratio of males to females. These differences were not present at intake, thus indicating that the HX group has naturally developed into a group dominated by males. A t-test at the .05 level of significance found no significant differences in the DSS of the HX and normal groups.

INSTRUMENTATION AND EQUIPMENT

Developmental Sentence Score

The Developmental Sentence Analysis was developed by Laura Lee (1974) as a means of making detailed analysis of a child's usage of grammatical forms from a spontaneous speech sample (Appendix A). The last 50 utterances of a sample are used to permit the child time to "warm up" and only sentences containing a subject and a verb are used. The specific structures it looks at are categorized into indefinite pronouns, personal pronouns, main verbs, secondary verbs, negatives, conjunctions, interrogative reversals, and wh-questions. The child receives points for each form used with later developing structures receiving more points. A sentence point may also be

earned. The total points divided by 50 utterances yields a Developmental Sentence Score (DSS) with which to compare to norms. The norms have been developed on one-year, six-month-old children through eight-year-old children and combine male and female scores. When a child drops below the 10th percentile, s/he is considered expressive language delayed. Lee (1974) reported good construct vaildity and inter/intra-judge reliability (.71 and .73, respectively).

PEPPER Computer Program

The Programs to Examine Phonetic and Phonologic Evaluation Records (PEPPER) computer program, developed by Shriberg (1986), analyzes various aspects of phonology, including the eight most common phonological processes described previously. A spontaneous language sample is transcribed orthographically and phonemically into the computer, analysis is carried out by the computer based on the possible occurrence in the speech sample of each sound change, and the percentage of usage of each process for each subject is reported. In addition, the percentage of each process usage by each group can also be analyzed and reported. Reliability and validity are the same as the Natural Process Analysis developed by Shriberg and Kwiatkowski (1980). In their manual they reported good sample stability and inter/intra-judge reliability when

administration procedures were followed accurately. In addition, good construct and predictive validity were reported.

Equipment

A Sony transcribing tape recorder was used to phonemically transcribe the language samples on which the DSS analyses were done. An IBM-compatible computer was used in conjunction with the PEPPER computer program to analyze the transcriptions.

DATA ANALYSIS

Language samples had been collected from the four-year-old children and orthographically transcribed by research assistants as part of the PLDP longitudinal study. To obtain data needed for this study, the samples were then transcribed using broad phonemic transcription and the International Phonetic Alphabet (IPA). Consecutive utterances containing 90 different, intelligible words from each langauge sample were input into the PEPPER computer program (Shriberg, 1986) and analyzed for usage of 8 of the most common phonological processes. These processes included: (1) stopping, (2) palatal fronting, (3) liquid simplification, (4) unstressed syllable deletion, (5) final consonant deletion, (6) progressive and regressive assimilation, (7) cluster

reduction, and (8) velar fronting. A ninth category was included and labeled as "other" to account for any unusual phonological processes children used. In this way the comparison of the groups' use of unusual phonological processes were also examined.

Phonological process use in each of the three diagnostic groups were analyzed. Mean percentage of process use overall for each group was computed by dividing the number of times any process occurred by the total number of words in each language sample and then finding the average per diagnostic group. In addition, the mean percentage of use of each of the above nine process categories for each diagnostic group was determined by dividing the number of times a process was used by the number of opportunities for that process to be used and then finding the average for each diagnostic group. All data used to determine means was provided by the PEPPER program.

Because this was a complex design with three levels of the independent variable of language diagnosis, an Analysis of Variance and Tukey's multiple comparisons procedures were carried out at the .05 signficance level. Means for each diagnostic group for each of the analyses were compared.

RELIABILITY

Over 10 percent (four) of the speech samples were phonemically transcribed independently by two different graduate students in speech-language pathology to insure inter-rater reliability. These students underwent a training session in which three tapes, similar to those being used in this study, were transcribed together. Following this training session, each student transcribed four tapes used in this study individually and then compared their transcriptions. Point-to-point reliability was carried out on 10 percent of each transcription. The total number of consonants agreed upon divided by the total number of consonants agreed and disagreed upon yielded a mean percentage of agreement of 90 percent.

CHAPTER IV

RESULTS AND DISCUSSION

RESULTS

The purpose of this study was to compare the phonological process usage of children with a history of slow expressive language development (HX) with that of expressive language delayed (ELD) and normal developing (ND) children. In addition, phonological process usage in ELD children and ND children were compared. The Programs to Examine Phonetic and Phonologic Evaluation Records (PEPPER) (Schriberg, 1986), a computer program used to determine the percentage of phonological process usage from a language sample, was utilized for analysis of data.

The questions posed were: do ELD children exhibit a higher percentage of phonological processes than ND children, and are HX children significantly different in their percentage of phonological process usage from ND and/or ELD children?

Percentage of usage for phonological processes were analyzed for the ten ELD, ten HX, and ten ND children. This was carried out in two ways. First by comparing

percentage of usage means for the nine specific process categories (e.g., final consonant deletion, cluster reduction) and second by comparing percentage of usage means when the eight most commonly used processes were combined, indicating total phonological process usage of the entire language sample. Percentage of usage means and standard deviations obtained are presented in Tables III and VI (see Appendix C for individual data).

TABLE III

MEANS AND STANDARD DEVIATIONS FOR PERCENT PROCESS USAGE IN THREE DIAGNOSTIC GROUPS

Process	ELD		HX		ND	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Final Consonant Deletion	6.8	4.9	7.0	8.5	3.5	2.4
Assimilation	0.2	0.3	0.3	0.3	0.2	0.4
Velar Fronting	0.9	2.1	1.2	2.5	0.0	0.0
Stopping	11.7	15.0	14.5	10.5	6.1	6.9
Palatal Fronting	2.0	6.3	2.5	8.0	5.8	12.5
Liquid Simplification	20.4	22.8	5.9	6.4	8.8	14.7
Cluster Reduction	32.5	13.9	28.6	18.6	14.4	9.4
Unstressed Syllable Deletion	11.2	8.9	7.5	6.0	5.4	4.1
Other/Unusual Processes	2.2	1.7	2.3	2.6	1.4	1.1

TABLE IV

MEANS AND STANDARD DEVIATIONS FOR TOTAL PERCENT PROCESS USAGE IN THREE DIAGNOSTIC GROUPS

Process	ELD		HX		ND	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Total Processes Used	13.3	6.9	12.7	7.7	8.1	4.6

An analysis of variance (ANOVA) was used to compare the percentage of usage means of the ELD, HX, and ND subjects. Results revealed a significant difference between the groups for cluster reduction only (see Table V). A Tukey multiple comparisons procedure was used to examine differences among groups. The results indicated that the ELD subjects used significantly more cluster reduction than did the ND subjects.

The results suggest that ELD children use more cluster reduction than do the ND children and that the HX children are not significantly different from either ND or ELD children in their process usage.

Additional analysis of the data was carried out to explore findings further.

The question was raised as to whether the ELD or HX children may be avoiding words with difficult sounds (i.e., palatals, liquids) or syllable structures. If so, their usage of simplification processes would be decreased because they would have fewer opportunities to demonstrate process use. To answer this question, the PEPPER analysis summary sheet was referred to. It provided the total number of times each process could have been used for each language sample. Group means for possible occurrence for each process were compared using ANOVA and Tukey's multiple comparisons procedure at the

TABLE V

SUMMARY OF ANOVA RESULTS COMPARING PERCENTAGE OF USAGE MEANS IN ELD, HX, AND ND SUBJECTS

Source	Sum of Squares	DF	Mean Square	F	Probability
Final Consonant Deletion					
Between Groups	77.78	2	38.89	1.15	.33
Within Groups	914.13	27	33.86		
Assimilation					
Between Groups	0.04	2	0.02	0.18	.84
Within Groups	3.00	27	0.11		
Velar Fronting					
No Variance					
Stopping					
Between Groups	364.44	2	182.22	1.43	.26
Within Groups	3430.50	27	127.06		
Palatal Fronting					
Between Groups	86.84	2	43.42	0.51	.61
Within Groups	2318.15	27	85.86		
Liquid Simplification					
Between Groups	1279.47	2	639.74	2.48	.10
Within Groups	6979.17	27	258.49		
Cluster Reduction					
Between Groups	1811.46	2	905.73	4.32	.03*
Within Groups	5663.74	27	209.77		
Unstressed Syllable Deletion					
Between Groups	170.46	2	85.23	1.95	.16
Within Groups	1181.67	27	43.77		

*Significant at $p < .05$

.05 level of significance. These tests indicated the HX children were using words with velars significantly less often than were the ELD children (see Table VI). No other significant differences were found. These results suggest that the HX children may be avoiding words containing velars, but in general they indicate that ELD and HX subjects were using contexts for phonological processes with similar frequency relative to ND subjects, and avoidance of sounds or syllable structures did not substantially affect the percentage of process usage results presented earlier.

TABLE VI

GROUP MEANS AND STANDARD DEVIATIONS FOR POSSIBLE CONTEXTS FOR PHONOLOGICAL PROCESSES

	ELD		HX		ND	
Process	Mean	S.D.	Mean	S.D.	Mean	S.D.
Final Consonant Deletion	110.9	34.2	116.7	28.2	108.9	15.4
Assimilation	256.4	70.8	273.7	56.5	238.3	56.8
Velar Fronting	26.5	7.5	19.2	7.5	20.8	4.0*
Stopping	79.8	43.6	88.4	30.4	90.2	15.4
Palatal Fronting	3.9	2.8	4.2	2.9	5.9	2.8
Liquid Simplification	13.1	4.6	16.1	7.1	13.2	8.4
Cluster Reduction	33.4	13.9	42.1	24.4	35.9	7.9
Unstressed Syllable Deletion (two-syllable words)	57.3	25.2	49.6	24.6	52.2	15.3
Unstressed Syllable Deletion (three+-syllable words)	4.6	2.5	4.7	4.2	4.4	2.5

*Significant at $p < .05$.

Another area which required attention was the intelligibility of the language samples. It was obvious from the orthographic transcriptions of the tapes that a large number of words were unintelligible. This was not due to poor quality of the audio tapes, but appeared to be due to the use of poor articulation resulting in productions that were too dissimilar from the target forms to be recognized. Because the target was unknown, the PEPPER could not determine what process was being used. The question arose: do the ELD and/or the HX children have a significantly greater number of unintelligible words in their language samples than the ND children. A significant difference in this area would result in an apparent similarity between the ELD and/or the HX groups and the ND group, which would more truly be attributed to the fact that large numbers of the former's words were too unintelligible to be subjected to analysis.

The number of unintelligible words identified in the orthographic transcriptions per total words was used to determine the percentage of unintelligible words for each language sample. The ND group displayed a mean percentage of unintelligibility of 2.4 (standard deviation 1.4), while the HX group yielded a mean percentage of 6.2 (standard deviation 3.5), and the ELD group used a mean percentage of 8.5 (standard deviation 4.5). Group means

were compared using ANOVA and a Tukey multiple comparisons procedure at the .05 level of significance (see Table VII). Significant differences were found between the ND and HX groups and between the ND and ELD groups. Thus, both the HX and ELD children had a significantly greater percentage of unintelligible words in their language samples than the ND children. Based on these results, it is believed that significant differences could have been found on more phonological processes had the target words on the language samples been known. Relatively large differences were found between ND and ELD children in final consonant deletion, stopping, liquid simplification, and total processes used, and between ND and HX children on stopping, final consonant deletion and cluster reduction, though they failed to reach significance. If more words had been intelligible, these differences might have become signficant.

TABLE VII

SUMMARY OF ANOVA RESULTS COMPARING PERCENTAGE OF UNINTELLIGIBLE WORDS USED BY THREE DIAGNOSTIC GROUPS

Source	Sum of Squares	DF	Mean Square	F	Probability
Between Groups	189.80	2	94.90	8.15	.01*
Within Groups	314.50	27	11.65		

*Significant at $p < .05$.

DISCUSSION

The results of this study showed that ELD children used a significantly higher percentage of cluster reduction than the ND children. Cluster reduction was found by Haelsig and Madison (1986) to be used by normal four-year-old children in 10 percent of the opportunities given. The ND children used this process at approximately the expected percentage (13 percent), while the ELD children used it with approximately three times greater frequency (33 percent) than what was expected. This higher percentage of usage suggests phonological delay in the ELD group and agrees with research by Schmauch, Panagos, and Klich (1978), Paul and Jennings (in press), Fey and Stalker (1986), and Schwartz et al. (1980) that expressive language delayed children appear to exhibit a delayed phonological ability by using a higher percentage of phonological processes.

The HX children were significantly different from neither ELD nor ND children in their usage of various phonological processes, suggesting they fall somewhere in between. This could be interpreted to indicate that the hypothesis which proposed that the HX children would use a significantly higher percentage of processes than the ND children was unsupported. However, the spirit of the hypothesis was supported in the process cluster reduction.

The intent of the hypothesis was to show the HX subjects had not caught up with the ND subjects in their ability to suppress phonological processes. Because they were not significantly different from either the ELD or the ND groups in cluster reduction usage, it can be inferred that they fell somewhere between the two groups in their process usage. This inference would suggest that the HX group is in fact showing some remnants of their delay and has not completely caught up with the ND children in their phonological development.

Although cluster reduction was the only process in which a significant difference was found, other processes displayed substantial differences between the ELD or HX groups and the ND group. The ELD group used approximately twice the percentage of usage of the phonological processes final consonant deletion, stopping, liquid simplification, and unstressed syllable deletion than the ND group. In addition, approximately twice the percentage of usage of the processes final consonant deletion, stopping, and cluster reduction was used by the HX group than the ND group. Another way of looking at these substantial differences is to compare the range of process usage within groups with that of other groups. As one example, when looking at the total words in each language sample upon which processes were used, the ELD

group displayed a range of 4 to 25 percent total process usage, the HX group showed a range of 4 to 28 percent, and the ND group's range was 2 to 15 percent (see Figure 2). While these ranges overlap, the ELD and HX group's ranges are far more similar to each other than to the ND group's range suggesting the HX group is continuing to display a phonological ability like that of the ELD group. The ELD and HX group's ranges are substantially broader than the ND group's, although statistical significance was not found.

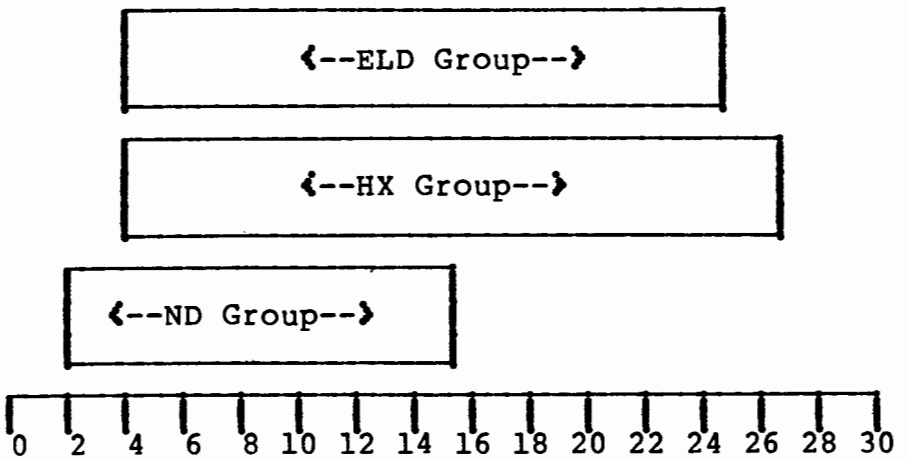

Figure 2. Group ranges of the percentage of total words on which phonological processes were used in each language sample.

As stated previously, it is expected from the literature by Fey and Stalker (1986) and Schwartz et al. (1980) that language-delayed children will demonstrate phonological delay by using a higher percentage of common

phonological processes than normally developing children of the same age and use processes for a longer time. The review of literature also concluded from Dyson and Paden (1983), Grunwell (1982), Hodson and Paden (1981), Ingram (1976), and Stoel-Gammon and Dunn (1985) that normal four year olds will exhibit liquid simplification, cluster reduction, and unstressed syllable deletion and have suppressed before age four their usage of final consonant deletion and stopping. Because the ELD and HX groups are continuing to use processes usually suppressed before age four, and use a substantially higher percentage than the ND group of processes expected to exist at age four, a phonological delay could be suspected to exist in the ELD and HX children. This finding would be consistent with that of Paul and Jennings (in press) as they found a phonological delay to exist in these same children at age 2. However, this suggestion would need to be substantiated by further research with larger samples and procedures designed to get around the intelligibility issue raised in this study.

It was determined that the ELD and HX children were not avoiding difficult sounds or syllable structures so as to affect the results. However, significant differences were found when comparing the percentage of unintelligible words of the language samples. Also, some

ELD subjects were 15 percent unintelligible and some HX subjects 12 percent unintelligible, while none of the ND subjects were ever more than 5 percent unintelligible with the majority (70 percent) of the ND subjects never being more than 2 percent unintelligible (see Appendix C). It is probable that the unintelligible words were being acted on by some phonological process. Had the ELD and HX subjects' utterances been more transcribable, their percentage of phonological process usage could have been increased. However, the ND results would most likely not be effected by more transcribable utterances. This suggests that the HX and ELD children were probably even more delayed in their phonological ability than this study showed, and differences that were substantial but failed to reach significance may have increased in magnitude if more of the unintelligible words could have been compared to their targets.

It is concluded from the fact that the ELD and HX groups displayed significantly more unintelligible words than the ND group, the ELD and HX groups are phonologically immature. This demonstrated delay in phonological ability supports Bishop and Edmundson's (1987) view that children with a history of slow expressive language development will recover in expressive syntax before they move into the normal range of phonological

development. The unintelligibility of the ELD and HX groups also resulted in fewer words which could be analyzed by the PEPPER, decreasing the percentage of phonological process usage found in these two groups. Due to the unintelligibility, more research is needed to provide additional and more complete information on the delays this study has documented.

CHAPTER V

SUMMARY AND IMPLICATIONS

SUMMARY

Language delay and phonological delay have been shown to coexist. Because they so often co-occur, it is possible that they may interact, sharing a relationship during the child's development. A group of children who were "late talkers" as toddlers, achieved normal development in their syntactic ability by the preschool period. Because their language abilities are known to have increased rapidly, data on their phonological development could provide information on the relationship between phonological and syntactic development.

The purpose of this study was to compare the percentage of phonological process usage of the eight most commonly used simplification processes in four-year-old ELD, HX, and ND children. The questions this study sought to answer were: do ELD children exhibit a higher percentage of phonological process usage than ND children, and are HX children significantly different in their percentage of phonological process usage than ND and/or ELD children.

Children from the Portland Language Development Project, a longitudinal study of language development in late talkers, were grouped according to the Language Development Survey (Rescorla, 1989) at 20 months and their Developmental Sentence Score (Lee, 1974) at 4 years. Language samples, collected at age 4, containing 90 different words each from 10 ELD, 10 HX, and 10 ND children were phonemically transcribed and input onto the PEPPER (Shriberg, 1986) for analysis.

In answering the questions posed, results of ANOVA and Tukey multiple comparison procedures indicated that the ELD subjects used a significantly higher percentage of cluster reduction than the ND subjects. No other significant differences were found, although several processes were used substantially more frequently by ELD and HX children than by ND children.

These results suggested that ELD children are delayed in their phonological process suppression of cluster reduction only. HX children, while not significantly different from the ELD or ND children in their percentage of phonological process usage, appeared to fall somewhere between the two groups in their ability to suppress cluster reduction.

The results were analyzed further to determine if avoidance or unintelligibility effected the percentage of

usage means results. It was concluded that avoidance of sounds or syllable structures did not affect process usage in either the ELD or HX groups. Significant differences were found, though, between the ND and HX groups and between the ND and ELD groups in the percentage of unintelligible words found in the language samples. Had more words in the HX and ELD samples been transcribable, more phonological processes may have been identified and a greater disparity between the ELD or HX groups and the ND group might have been found.

RESEARCH IMPLICATIONS

This study supports the theory that a relationship between phonological and syntactic development may exist. Future research should be carried out to further investigate interaction in development. In doing so, it is recommended that language samples of children require a greater degree of structure (such as the eliciting of sentences or the retelling of a story) so that the target word is more easily identified and unintelligible words avoided. In addition, the controlling of stimuli during the language sample to provide for contexts for the phonological processes which were found to be substantial, but not significantly different, may aid in the finding of significant differences in these areas in the future.

Larger sample sizes are suggested to allow for greater power of statistical tests.

CLINICAL IMPLICATIONS

Results of this study support existing research indicating children with expressive language delays often have phonological deficits as well. Results also support research indicating children with prior language delay may improve in their syntactic ability more quickly than in their phonological ability. These findings provide an argument for the need to assess the phonological skills of ELD children. In addition, treatment should incorporate all delayed modalities together rather than one modality at a time so as to enhance the co-development which naturally occurs.

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APPENDIX A

DSS SCORING

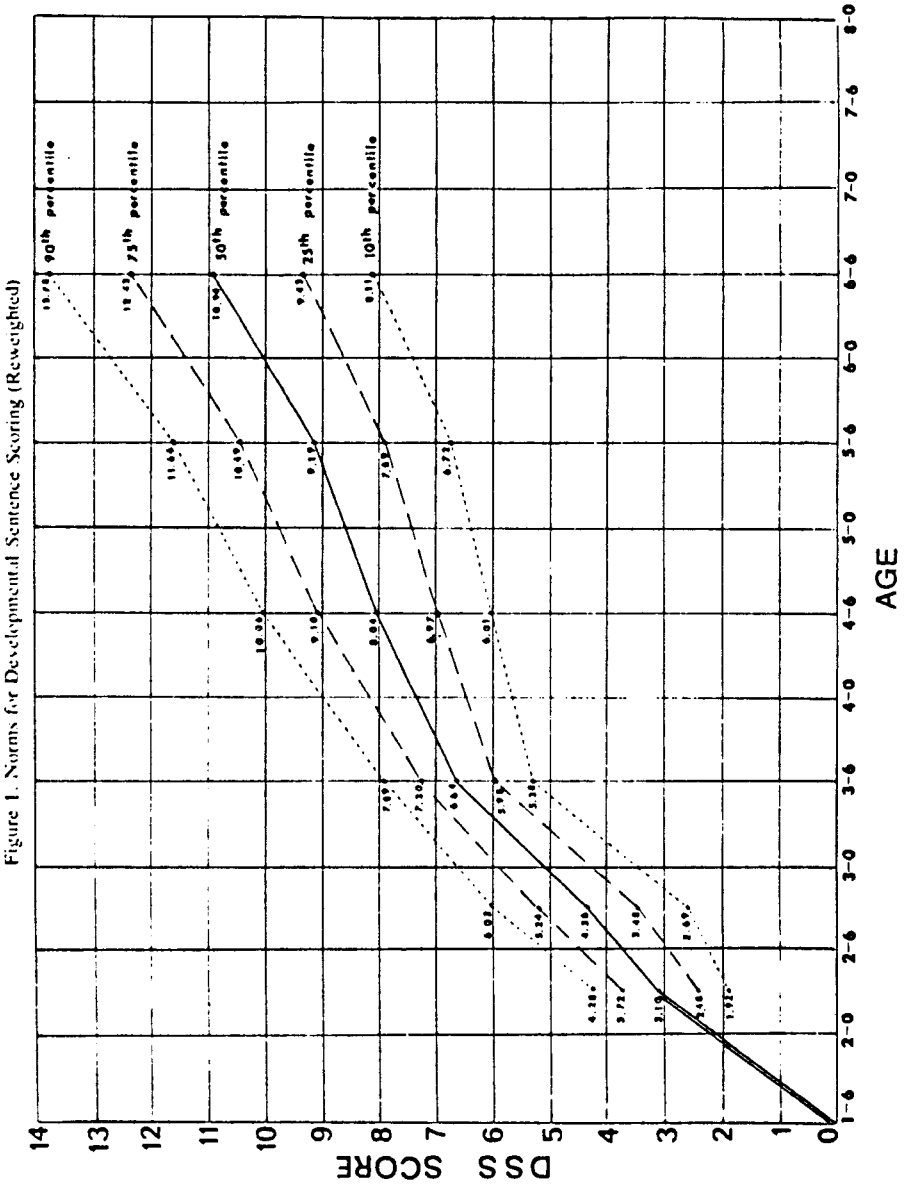

Figure 1. Norms for Developmental Sentence Scoring (Reweighted)

Chart 8. The Developmental Sentence Scoring (DSS) Reweighted Scores

SCORE	INDEFINITE PRONOUNS OR NOUN MODIFIERS	PERSONAL PRONOUNS	MAIN VERBS	SECONDARY VERBS
1	it, this, that	1st and 2nd person: I, me, my, mine, you, your(s)	A. Uninflected verb: *I see* you. B. copula, is or 's: *It's* red. C. is + verb + ing: He *is coming.*	
2		3rd person: he, him, his, she, her, hers	A. -s and -ed: *plays, played* B. irregular past: *ate, saw* C. Copula: *am, are, was, were* D. Auxiliary *am, are, was, were*	Five early-developing infinitives: I wan*na see* (want *to see)* I'm gon*na see* (going *to see)* I got*ta see* (got *to see)* Lemme [to] see (let me *[to] see)* Let's [to] play (let [us *to] play)*
3	A. no, some, more, all, lot(s), one(s), two (etc.), other(s), another B. something, somebody, someone	A. Plurals: we, us, our(s), they, them, their B. these, those		Non-complementing infinitives: I stopped *to play.* I'm afraid *to look.* It's hard *to do* that.
4	nothing, nobody, none, no one		A. can, will, may + verb: *may go* B. Obligatory do + verb: *don't go* C. Emphatic do + verb: I *do see.*	Participle, present or past: I see a boy *running.* I found the toy *broken.*
5		Reflexives: myself, yourself, himself, herself, itself, themselves		A. Early infinitival complements with differing subjects in kernels: I want you *to come.* Let him *[to] see.* B. Later infinitival complements: I had *to go.* I told him *to go.* I tried *to go.* He ought *to go.* C. Obligatory deletions: Make it *[to] go.* I'd better *[to] go.* D. Infinitive with wh-word: I know what *to get.* I know how *to do* it.
6		A. Wh-pronouns: who, which, whose, whom, what, that, how many, how much I know *who* came. That's *what* I said. B. Wh-word + infinitive: I know *what* to do. I know *who(m)* to take.	A. could, would, should, might + verb: *might come, could be* B. Obligatory does, did + verb C. Emphatic does, did + verb	
7	A. any, anything, anybody, anyone B. every, everything, everybody, everyone C. both, few, many, each, several, most, least, much, next, first, last, second (etc.)	(his) own, one, oneself, whichever, whoever, whatever Take *whatever* you like.	A. Passive with *get*, any tense Passive with *be*, any tense B. must, shall + verb: *must come* C. have + verb + en: *I've eaten* D. have got: I*'ve got* it.	Passive infinitival complement: With *get:* I have *to get dressed.* I don't want *to get hurt.* With *be:* I want *to be pulled.* It's going *to be locked.*
8			A. have been + verb + ing had been + verb + ing B. modal + have + verb + en: *may have eaten* C. modal + be + verb + ing: *could be playing* D. Other auxiliary combinations: *should have been sleeping*	Gerund: *Swinging* is fun. I like *fishing.* He started *laughing.*

APPENDIX B

LANGUAGE DEVELOPMENT SURVEY

Language Development Survey

Please check off each word that your child says SPONTANEOUSLY (not just imitates or understands). It's okay to count words that aren't pronounced clearly or are in "baby talk" ("baba" for bottle.).

FOODS
apple
banana
bread
butter
cake
candy
cereal
cheese
coffee
cookie
crackers
drink
egg
food
grapes
gum
hamburger
hotdog
icecream
juice
meat
milk
orange
pizza
pretzel
raisins
soda
soup
spaghetti
tea
toast
water

TOYS
ball
balloon
blocks
book
crayons
doll
picture
present
slide
swing
teddybear

OUTDOORS
flower
house
moon
rain
sidewalk
sky
snow
star
street
sun
tree

ANIMALS
bear
bee
bird
bug
bunny
cat
chicken
cow
dog
duck
elephant
fish
frog
horse
monkey
pig
puppy
snake
tiger
turkey
turtle

BODY PARTS
arm
bellybutton
bottom
chin
ear
elbow
eye
face
finger
foot
hair
hand
knee
leg
mouth
neck
nose
teeth
thumb
toe
tummy

PLACES
church
home
hospital
library
park
school
store
zoo

ACTIONS
bath
breakfast
bring
catch
clap
close
come
cough
cut
dance
dinner
doodoo
down
eat
feed
finish
fix
get
give
go
have
help
hit
hug
jump
kick
kiss
knock
look
love
lunch
make
nap
open
outside
pattycake
peekaboo
peepee
push
read
ride
run
see
show
shut
sing
sit
sleep
stop
take
throw
tickle
up
walk
want
wash

HOUSEHOLD
bathtub
bed
blanket
bottle
bowl
chair
clock
crib
cup
door
floor
fork
glass
knife
light
mirror
pillow
plate
potty
radio
room
sink
soap
spoon
stairs
table
telephone
towel
trash
T.V.
window

PERSONAL
brush
comb
glasses
key
money
paper
pen
pencil
penny
pocketbook
tissue
toothbrush
umbrella
watch

PEOPLE
aunt
baby
boy
daddy
doctor
girl
grandma
grandpa
lady
man
mommy
own name
pet name
uncle
Ernie, etc.

CLOTHES
belt
boots
coat
diaper
dress
gloves
hat
jacket
mittens
pajamas
pants
shirt
shoes
slippers
sneakers
socks
sweater

VEHICLES
bike
boat
bus
car
motorcycle
plane
stroller
train
trolley
truck

MODIFIERS
allgone
all right
bad
big
black
blue
broken
clean
cold
dark
dirty
dry
good
happy
heavy
hot
hungry
little
mine
more
nice
pretty
red
stinky
that
this
tired
wet
white
yellow
yucky

OTHER
A, B, C, etc.
away
booboo
byebye
excuse me
here
hi, hello
in
me
meow
my
myself
nightnight
no
off
on
out
please
Sesame St.
shut up
thank you
there
under
welcome
what
where
why
woofwoof
yes
you
yumyum
1, 2, 3, etc.

Please list any other words your child uses here:

_____

_____

Does your child combine two or more words into phrases? (e.g. "more cookie," "car byebye," etc.) yes_____ no_____

Please write down three of your child's longest and best sentences or phrases.

1. _____

2. _____

3. _____

APPENDIX C

RAW DATA BY SUBJECT

RAW DATA BY SUBJECT

Normally Developing (ND) Group

SUBJECT #	FCD	A	VF	S	PF	LS	CR	USD	Other	Total	Unintell.
4	3.5	0	0	17.5	0	14.3	23.3	0	1.0	13.0	2.0
36	2.0	1.3	0	0	0	0	5.4	10.2	1.0	4.0	2.0
40	1.8	0	0	0	0	0	7.7	6.0	4.0	5.0	1.0
50	2.0	0	0	4.6	0	11.1	15.4	4.4	2.0	7.0	4.0
59	.7	.3	0	2.4	0	0	2.6	0	1.0	2.0	2.0
78	6.5	0	0	2.6	0	16.7	28.6	7.9	1.0	10.0	1.0
133	.8	0	0	4.6	0	0	4.4	5.6	2.0	4.0	4.0
139	4.4	0	0	16.3	33.3	46.2	21.6	5.9	0	14.0	1.0
141	6.9	.8	0	13.4	25.0	0	23.8	1.8	1.0	15.0	5.0
144	6.7	0	0	0	0	0	11.4	12.2	1.0	7.0	2.0

KEY:
FCD - Final Consonant Deletion
A - Assimilation
VF - Velar Fronting
S - Stopping
PF - Palatal Fronting
LS - Liquid Simplification
CR - Cluster Reduction
USD - Unstressed Syllable Deletion
Unintell - Unintelligible Words

History of Slow Expressive Language Development (HX) Group

SUBJECT #	FCD	A	VF	S	PF	LS	CR	USD	Other	Total	Unintell.
6	2.4	0	0	6.5	0	3.8	8.1	3.3	1.0	5.0	2.0
7	1.9	0	0	9.9	0	0	21.9	16.7	1.0	7.0	3.0
41	4.4	.3	0	4.1	0	0	19.4	3.5	1.0	8.0	7.0
53	.9	.4	0	28.1	0	0	61.5	2.0	8.0	23.0	2.0
57	2.2	.9	0	25.3	0	8.3	28.6	1.9	3.0	11.0	6.0
86	20.4	.4	5.6	21.6	0	0	53.2	11.5	6.0	28.0	4.0
87	2.4	0	0	29.3	0	18.2	21.6	13.3	0	12.0	11.0
100	24.8	.4	6.3	3.0	25.0	7.4	22.2	13.2	1.0	14.0	7.0
102	7.7	.5	0	11.6	0	12.5	44.0	9.6	2.0	15.0	12.0
114	3.4	0	0	5.8	0	0	5.2	0	0	4.0	8.0

KEY: FCD - Final Consonant Deletion
A - Assimilation
VF - Velar Fronting
S - Stopping
PF - Palatal Fronting
LS - Liquid Simplification
CR - Cluster Reduction
USD - Unstressed Syllable Deletion
Unintell - Unintelligible Words

Expressive Language Delayed (ELD) Group

SUBJECT #	FCD	A	VF	S	PF	LS	CR	USD	Other	Total	Unintell.
12	7.2	.4	3.2	1.6	0	0	20.8	8.2	1.0	4.0	2.0
29	4.9	0	0	11.0	0	0	31.0	7.0	3.0	12.0	15.0
60	16.1	.6	6.1	37.2	0	50.0	68.4	18.0	3.0	25.0	9.0
92	11.6	0	0	0	0	25.0	39.4	7.4	2.0	15.0	9.0
94	7.6	.4	0	2.4	0	0	22.2	9.5	5.0	16.0	6.0
107	0	0	0	13.5	0	0	34.3	4.4	1.0	9.0	6.0
111	1.1	0	0	1.9	0	50.0	29.2	20.5	3.0	10.0	15.0
119	10.4	0	0	9.3	20.0	33.3	31.8	30.2	4.0	12.0	5.0
122	5.6	0	0	0	0	0	26.7	2.8	0	6.0	5.0
142	3.6	.5	0	40.0	0	45.5	21.5	3.9	0	24.0	13.0

KEY: FCD - Final Consonant Deletion
A - Assimilation
VF - Velar Fronting
S - Stopping
PF - Palatal Fronting
LS - Liquid Simplification
CR - Cluster Reduction
USD - Unstressed Syllable Deletion
Unintell - Unintelligible Words

APPENDIX D

PEPPER SUMMARY SHEETS

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P004 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 143 Possible n-obs	%		WORD-FINAL 114 Possible n-obs	%
a. Correct (C)		125	87.41		104	91.23
b. Distortions (C-)		0	0.00		5	4.39
c. Consonant Deletions	(ICD)	2	1.40	(FCD)	4	3.51
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		0	0.00		1	0.88
f. ICD + UC		2	1.40			
g. Uncoded by Rule (UC-)		1	0.70		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	16	0	0.00	3	0	0.00
2. Possible Occurrence	143	16	11.19	114	3	2.63
3. Obtained Occurrence (SCS)	143	0	0.00	114	0	0.00
b. Stopping (S)						
1. NPA Summary	49	14	28.57	31	0	0.00
2. Possible Occurrence	143	49	34.27	114	31	27.19
3. Obtained Occurrence (SCS)	143	14	9.79	114	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	4	0	0.00	3	0	0.00
2. Possible Occurrence	143	4	2.80	114	3	2.63
3. Obtained Occurrence (SCS)	143	0	0.00	114	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	6	1	16.67	1	0	0.00
2. Possible Occurrence	143	6	4.20	114	1	0.88
3. Obtained Occurrence (SCS)	143	1	0.70	114	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 11 Possible n-obs	%	WORD-FINAL 19 Possible n-obs	%
a. Correct (C)	10	90.91	11	57.89
b. Distortions (C-)	0	0.00	1	5.26
c. Cluster Reduction (CR)	0	0.00	7	36.84
d. Uncoded (UC)	1	9.09	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 65 Possible n-obs	%	3+-SYLLABLE 3 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	0	0.00	0	0.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
MAR 19, '91

Child/Group 9P087 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 155 Possible n-obs	%		WORD-FINAL 125 Possible n-obs	%
a. Correct (C)		131	84.52		120	96.00
b. Distortions (C-)		0	0.00		2	1.60
c. Consonant Deletions	(ICD)	0	0.00	(FCD)	3	2.40
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		0	0.00		0	0.00
f. ICD + UC		0	0.00			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	22	0	0.00	8	0	0.00
2. Possible Occurrence	155	22	14.19	125	8	6.40
3. Obtained Occurrence (SCS)	155	0	0.00	125	0	0.00
b. Stopping (S)						
1. NPA Summary	42	22	52.38	33	0	0.00
2. Possible Occurrence	155	42	27.10	125	33	26.40
3. Obtained Occurrence (SCS)	155	22	14.19	125	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	4	0	0.00	2	0	0.00
2. Possible Occurrence	155	4	2.58	125	2	1.60
3. Obtained Occurrence (SCS)	155	0	0.00	125	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	7	2	28.57	4	0	0.00
2. Possible Occurrence	155	7	4.52	125	4	3.20
3. Obtained Occurrence (SCS)	155	2	1.29	125	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 15 Possible n-obs	%	WORD-FINAL 36 Possible n-obs	%
a. Correct (C)	13	86.67	26	72.22
b. Distortions (C-)	0	0.00	1	2.78
c. Cluster Reduction (CR)	2	13.33	9	25.00
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 45 Possible n-obs	%	3+-SYLLABLE 15 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	7	15.56	1	6.67

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
MAR 19, '91

Child/Group 9P114 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 153 Possible n-obs	%		WORD-FINAL 118 Possible n-obs	%
a. Correct (C)		148	96.73		114	96.61
b. Distortions (C-)		0	0.00		0	0.00
c. Consonant Deletions	(ICD)	0	0.00	(FCD)	4	3.39
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		0	0.00		0	0.00
f. ICD + UC		0	0.00			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	4	0	0.00	5	0	0.00
2. Possible Occurrence	153	4	2.61	118	5	4.24
3. Obtained Occurrence (SCS)	153	0	0.00	118	0	0.00
b. Stopping (S)						
1. NPA Summary	36	5	13.89	51	0	0.00
2. Possible Occurrence	153	36	23.53	118	51	43.22
3. Obtained Occurrence (SCS)	153	5	3.27	118	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	5	0	0.00	2	0	0.00
2. Possible Occurrence	153	5	3.27	118	2	1.69
3. Obtained Occurrence (SCS)	153	0	0.00	118	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	9	0	0.00	3	0	0.00
2. Possible Occurrence	153	9	5.88	118	3	2.54
3. Obtained Occurrence (SCS)	153	0	0.00	118	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 41 Possible n-obs	%	WORD-FINAL 56 Possible n-obs	%
a. Correct (C)	38	92.68	53	94.64
b. Distortions (C-)	0	0.00	1	1.79
c. Cluster Reduction (CR)	3	7.32	2	3.57
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 51 Possible n-obs	%	3+-SYLLABLE 2 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	0	0.00	0	0.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
MAR 19, '91

Child/Group 9P057
Study Identification
DOB
Age at Sampling Date

Sampling Date
Sampling Clinician
Transcription Date
Transcriber

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 137 Possible n-obs	%		WORD-FINAL 92 Possible n-obs	%
a. Correct (C)		111	81.02		83	90.22
b. Distortions (C-)		0	0.00		4	4.35
c. Consonant Deletions	(ICD)	0	0.00	(FCD)	2	2.17
d. Assimilations	(RA)	2	1.46	(PA)	0	0.00
e. Uncoded (UC)		3	2.19		3	3.26
f. ICD + UC		3	2.19			
g. Uncoded by Rule (UC-)		1	0.73		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	13	0	0.00	0	0	******
2. Possible Occurrence	137	13	9.49	92	0	0.00
3. Obtained Occurrence (SCS)	137	0	0.00	92	0	0.00
b. Stopping (S)						
1. NPA Summary	50	19	38.00	25	0	0.00
2. Possible Occurrence	137	50	36.50	92	25	27.17
3. Obtained Occurrence (SCS)	137	19	13.87	92	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	4	0	0.00	2	0	0.00
2. Possible Occurrence	137	4	2.92	92	2	2.17
3. Obtained Occurrence (SCS)	137	0	0.00	92	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	10	1	10.00	2	0	0.00
2. Possible Occurrence	137	10	7.30	92	2	2.17
3. Obtained Occurrence (SCS)	137	1	0.73	92	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 7 Possible n-obs	%	WORD-FINAL 28 Possible n-obs	%
a. Correct (C)	7	100.00	17	60.71
b. Distortions (C-)	0	0.00	1	3.57
c. Cluster Reduction (CR)	0	0.00	10	35.71
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 51 Possible n-obs	%	3+-SYLLABLE 3 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	1	1.96	0	0.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
MAR 19, '91

Child/Group 9P142 _____ Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 252 Possible n-obs	%		WORD-FINAL 166 Possible n-obs	%
a. Correct (C)		163	64.68		155	93.37
b. Distortions (C-)		0	0.00		1	0.60
c. Consonant Deletions	(ICD)	0	0.00	(FCD)	6	3.61
d. Assimilations	(RA)	0	0.00	(PA)	2	1.20
e. Uncoded (UC)		1	0.40		1	0.60
f. ICD + UC		1	0.40			
g. Uncoded by Rule (UC-)		4	1.59		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	28	0	0.00	7	0	0.00
2. Possible Occurrence	252	28	11.11	166	7	4.22
3. Obtained Occurrence (SCS)	252	0	0.00	166	0	0.00
b. Stopping (S)						
1. NPA Summary	120	79	65.83	80	1	1.25
2. Possible Occurrence	252	120	47.62	166	80	48.19
3. Obtained Occurrence (SCS)	252	79	31.35	166	1	0.60
c. Palatal Fronting (PF)						
1. NPA Summary	4	0	0.00	0	0	******
2. Possible Occurrence	252	4	1.59	166	0	0.00
3. Obtained Occurrence (SCS)	252	0	0.00	166	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	10	5	50.00	1	0	0.00
2. Possible Occurrence	252	10	3.97	166	1	0.60
3. Obtained Occurrence (SCS)	252	5	1.98	166	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 8 Possible n-obs	%	WORD-FINAL 57 Possible n-obs	%
a. Correct (C)	1	12.50	50	87.72
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	7	87.50	7	12.28
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 95 Possible n-obs	%	3+-SYLLABLE 7 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	2	2.11	2	28.57

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
MAR 19, '91

Child/Group 9P111 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 144 Possible n-obs	%		WORD-FINAL 94 Possible n-obs	%
a. Correct (C)		132	91.67		89	94.68
b. Distortions (C-)		0	0.00		1	1.06
c. Consonant Deletions	(ICD)	3	2.08	(FCD)	1	1.06
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		2	1.39		1	1.06
f. ICD + UC		5	3.47			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	14	0	0.00	13	0	0.00
2. Possible Occurrence	144	14	9.72	94	13	13.83
3. Obtained Occurrence (SCS)	144	0	0.00	94	0	0.00
b. Stopping (S)						
1. NPA Summary	25	0	0.00	29	1	3.45
2. Possible Occurrence	144	25	17.36	94	29	30.85
3. Obtained Occurrence (SCS)	144	0	0.00	94	1	1.06
c. Palatal Fronting (PF)						
1. NPA Summary	1	0	0.00	0	0	******
2. Possible Occurrence	144	1	0.69	94	0	0.00
3. Obtained Occurrence (SCS)	144	0	0.00	94	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	14	7	50.00	2	1	50.00
2. Possible Occurrence	144	14	9.72	94	2	2.13
3. Obtained Occurrence (SCS)	144	7	4.86	94	1	1.06

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 6 Possible n-obs	%	WORD-FINAL 18 Possible n-obs	%
a. Correct (C)	1	16.67	15	83.33
b. Distortions (C-)	0	0.00	1	5.56
c. Cluster Reduction (CR)	5	83.33	2	11.11
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 31 Possible n-obs	%	3+-SYLLABLE 8 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	7	22.58	1	12.50

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
MAR 19, '91

Child/Group 9P060
Study Identification
DOB
Age at Sampling Date

Sampling Date
Sampling Clinician
Transcription Date
Transcriber

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 195 Possible n-obs	%		WORD-FINAL 118 Possible n-obs	%
a. Correct (C)		152	77.95		90	76.27
b. Distortions (C-)		0	0.00		2	1.69
c. Consonant Deletions	(ICD)	4	2.05	(FCD)	19	16.10
d. Assimilations	(RA)	2	1.03	(PA)	0	0.00
e. Uncoded (UC)		2	1.03		2	1.69
f. ICD + UC		6	3.08			
g. Uncoded by Rule (UC-)		1	0.51		1	0.85

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	23	2	8.70	10	0	0.00
2. Possible Occurrence	195	23	11.79	118	10	8.47
3. Obtained Occurrence (SCS)	195	2	1.03	118	0	0.00
b. Stopping (S)						
1. NPA Summary	51	27	52.94	27	2	7.41
2. Possible Occurrence	195	51	26.15	118	27	22.88
3. Obtained Occurrence (SCS)	195	27	13.85	118	2	1.69
c. Palatal Fronting (PF)						
1. NPA Summary	0	0	******	1	0	0.00
2. Possible Occurrence	195	0	0.00	118	1	0.85
3. Obtained Occurrence (SCS)	195	0	0.00	118	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	8	5	62.50	6	2	33.33
2. Possible Occurrence	195	8	4.10	118	6	5.08
3. Obtained Occurrence (SCS)	195	5	2.56	118	2	1.69

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 13 Possible n-obs	%	WORD-FINAL 25 Possible n-obs	%
a. Correct (C)	0	0.00	11	44.00
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	13	100.00	13	52.00
d. Uncoded (UC)	0	0.00	1	4.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 55 Possible n-obs	%	3+-SYLLABLE 6 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	10	18.18	1	16.67

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P122 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

	WORD-INITIAL 135 Possible n-obs	%		WORD-FINAL 84 Possible n-obs	%
a. Correct (C)	134	99.26		75	89.29
b. Distortions (C-)	0	0.00		3	3.57
c. Consonant Deletions (ICD)	0	0.00	(FCD)	5	5.95
d. Assimilations (RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)	0	0.00		1	1.19
f. ICD + UC	0	0.00			
g. Uncoded by Rule (UC-)	1	0.74		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	18	0	0.00	4	0	0.00
2. Possible Occurrence	135	18	13.33	84	4	4.76
3. Obtained Occurrence (SCS)	135	0	0.00	84	0	0.00
b. Stopping (S)						
1. NPA Summary	42	0	0.00	27	0	0.00
2. Possible Occurrence	135	42	31.11	84	27	32.14
3. Obtained Occurrence (SCS)	135	0	0.00	84	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	1	0	0.00	0	0	******
2. Possible Occurrence	135	1	0.74	84	0	0.00
3. Obtained Occurrence (SCS)	135	0	0.00	84	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	3	0	0.00	1	0	0.00
2. Possible Occurrence	135	3	2.22	84	1	1.19
3. Obtained Occurrence (SCS)	135	0	0.00	84	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 2 Possible n-obs	%	WORD-FINAL 13 Possible n-obs	%
a. Correct (C)	2	100.00	9	69.23
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	0	0.00	4	30.77
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 67 Possible n-obs	%	3+-SYLLABLE 4 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	1	1.49	1	25.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P119 _____ Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 116 Possible n-obs	%		WORD-FINAL 77 Possible n-obs	%
a. Correct (C)		103	88.79		65	84.42
b. Distortions (C-)		0	0.00		0	0.00
c. Consonant Deletions	(ICD)	2	1.72	(FCD)	8	10.39
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		1	0.86		4	5.19
f. ICD + UC		3	2.59			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	23	0	0.00	11	0	0.00
2. Possible Occurrence	116	23	19.83	77	11	14.29
3. Obtained Occurrence (SCS)	116	0	0.00	77	0	0.00
b. Stopping (S)						
1. NPA Summary	27	5	18.52	27	0	0.00
2. Possible Occurrence	116	27	23.28	77	27	35.06
3. Obtained Occurrence (SCS)	116	5	4.31	77	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	1	1	100.00	4	0	0.00
2. Possible Occurrence	116	1	0.86	77	4	5.19
3. Obtained Occurrence (SCS)	116	1	0.86	77	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	8	4	50.00	4	0	0.00
2. Possible Occurrence	116	8	6.90	77	4	5.19
3. Obtained Occurrence (SCS)	116	4	3.45	77	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 4 Possible n-obs	%	WORD-FINAL 18 Possible n-obs	%
a. Correct (C)	1	25.00	12	66.67
b. Distortions (C-)	0	0.00	2	11.11
c. Cluster Reduction (CR)	3	75.00	4	22.22
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 37 Possible n-obs	%	3+-SYLLABLE 6 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	9	24.32	4	66.67

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P107 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 134 Possible n-obs	%		WORD-FINAL 87 Possible n-obs	%
a. Correct (C)		123	91.79		86	98.85
b. Distortions (C-)		0	0.00		0	0.00
c. Consonant Deletions	(ICD)	1	0.75	(FCD)	0	0.00
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		0	0.00		1	1.15
f. ICD + UC		1	0.75			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	8	0	0.00	8	0	0.00
2. Possible Occurrence	134	8	5.97	87	8	9.20
3. Obtained Occurrence (SCS)	134	0	0.00	87	0	0.00
b. Stopping (S)						
1. NPA Summary	48	10	20.83	26	0	0.00
2. Possible Occurrence	134	48	35.82	87	26	29.89
3. Obtained Occurrence (SCS)	134	10	7.46	87	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	6	0	0.00	0	0	******
2. Possible Occurrence	134	6	4.48	87	0	0.00
3. Obtained Occurrence (SCS)	134	0	0.00	87	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	10	0	0.00	4	0	0.00
2. Possible Occurrence	134	10	7.46	87	4	4.60
3. Obtained Occurrence (SCS)	134	0	0.00	87	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 10 Possible n-obs	%	WORD-FINAL 25 Possible n-obs	%
a. Correct (C)	10	100.00	13	52.00
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	0	0.00	12	48.00
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 43 Possible n-obs	%	3+-SYLLABLE 3 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	2	4.65	0	0.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P094 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence		WORD-INITIAL 149 Possible n-obs	%		WORD-FINAL 132 Possible n-obs	%
a. Correct (C)		131	87.92		118	89.39
b. Distortions (C-)		1	0.67		3	2.27
c. Consonant Deletions	(ICD)	9	6.04	(FCD)	10	7.58
d. Assimilations	(RA)	1	0.67	(PA)	0	0.00
e. Uncoded (UC)		5	3.36		1	0.76
f. ICD + UC		14	9.40			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	18	0	0.00	11	0	0.00
2. Possible Occurrence	149	18	12.08	132	11	8.33
3. Obtained Occurrence (SCS)	149	0	0.00	132	0	0.00
b. Stopping (S)						
1. NPA Summary	53	2	3.77	30	0	0.00
2. Possible Occurrence	149	53	35.57	132	30	22.73
3. Obtained Occurrence (SCS)	149	2	1.34	132	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	1	0	0.00	1	0	0.00
2. Possible Occurrence	149	1	0.67	132	1	0.76
3. Obtained Occurrence (SCS)	149	0	0.00	132	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	15	0	0.00	2	0	0.00
2. Possible Occurrence	149	15	10.07	132	2	1.52
3. Obtained Occurrence (SCS)	149	0	0.00	132	0	0.00

B. Clusters

1. 100% Possibility of Occurrence	WORD-INITIAL 11 Possible n-obs	%	WORD-FINAL 25 Possible n-obs	%
a. Correct (C)	6	54.55	12	48.00
b. Distortions (C-)	0	0.00	10	40.00
c. Cluster Reduction (CR)	5	45.45	3	12.00
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence	2-SYLLABLE 56 Possible n-obs	%	3+-SYLLABLE 7 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	3	5.36	3	42.86

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P094 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 149 Possible n-obs	%		WORD-FINAL 132 Possible n-obs	%
a. Correct (C)		131	87.92		118	89.39
b. Distortions (C-)		1	0.67		3	2.27
c. Consonant Deletions	(ICD)	9	6.04	(FCD)	10	7.58
d. Assimilations	(RA)	1	0.67	(PA)	0	0.00
e. Uncoded (UC)		5	3.36		1	0.76
f. ICD + UC		14	9.40			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	18	0	0.00	11	0	0.00
2. Possible Occurrence	149	18	12.08	132	11	8.33
3. Obtained Occurrence (SCS)	149	0	0.00	132	0	0.00
b. Stopping (S)						
1. NPA Summary	53	2	3.77	30	0	0.00
2. Possible Occurrence	149	53	35.57	132	30	22.73
3. Obtained Occurrence (SCS)	149	2	1.34	132	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	1	0	0.00	1	0	0.00
2. Possible Occurrence	149	1	0.67	132	1	0.76
3. Obtained Occurrence (SCS)	149	0	0.00	132	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	15	0	0.00	2	0	0.00
2. Possible Occurrence	149	15	10.07	132	2	1.52
3. Obtained Occurrence (SCS)	149	0	0.00	132	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 11 Possible n-obs	%	WORD-FINAL 25 Possible n-obs	%
a. Correct (C)	6	54.55	12	48.00
b. Distortions (C-)	0	0.00	10	40.00
c. Cluster Reduction (CR)	5	45.45	3	12.00
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 56 Possible n-obs	%	3+-SYLLABLE 7 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	3	5.36	3	42.86

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P029 _____ Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 136 Possible n-obs	%		WORD-FINAL 122 Possible n-obs	%
a. Correct (C)		125	91.91		111	90.98
b. Distortions (C-)		0	0.00		1	0.82
c. Consonant Deletions	(ICD)	1	0.74	(FCD)	6	4.92
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		2	1.47		4	3.28
f. ICD + UC		3	2.21			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	14	0	0.00	11	0	0.00
2. Possible Occurrence	136	14	10.29	122	11	9.02
3. Obtained Occurrence (SCS)	136	0	0.00	122	0	0.00
b. Stopping (S)						
1. NPA Summary	38	8	21.05	35	0	0.00
2. Possible Occurrence	136	38	27.94	122	35	28.69
3. Obtained Occurrence (SCS)	136	8	5.88	122	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	1	0	0.00	4	0	0.00
2. Possible Occurrence	136	1	0.74	122	4	3.28
3. Obtained Occurrence (SCS)	136	0	0.00	122	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	16	0	0.00	4	0	0.00
2. Possible Occurrence	136	16	11.76	122	4	3.28
3. Obtained Occurrence (SCS)	136	0	0.00	122	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 7 Possible n-obs	%	WORD-FINAL 35 Possible n-obs	%
a. Correct (C)	3	42.86	24	68.57
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	4	57.14	9	25.71
d. Uncoded (UC)	0	0.00	2	5.71

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 78 Possible n-obs	%	3+-SYLLABLE 8 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	6	7.69	0	0.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P012 _____ Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 160 Possible n-obs	%		WORD-FINAL 97 Possible n-obs	%
a. Correct (C)		155	96.87		88	90.72
b. Distortions (C-)		0	0.00		0	0.00
c. Consonant Deletions	(ICD)	2	1.25	(FCD)	7	7.22
d. Assimilations	(RA)	0	0.00	(PA)	1	1.03
e. Uncoded (UC)		1	0.62		0	0.00
f. ICD + UC		3	1.87			
g. Uncoded by Rule (UC-)		0	0.00		1	1.03

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	17	1	5.88	14	0	0.00
2. Possible Occurrence	160	17	10.62	97	14	14.43
3. Obtained Occurrence (SCS)	160	1	0.62	97	0	0.00
b. Stopping (S)						
1. NPA Summary	50	1	2.00	12	0	0.00
2. Possible Occurrence	160	50	31.25	97	12	12.37
3. Obtained Occurrence (SCS)	160	1	0.62	97	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	10	0	0.00	0	0	******
2. Possible Occurrence	160	10	6.25	97	0	0.00
3. Obtained Occurrence (SCS)	160	0	0.00	97	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	8	0	0.00	7	0	0.00
2. Possible Occurrence	160	8	5.00	97	7	7.22
3. Obtained Occurrence (SCS)	160	0	0.00	97	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 8 Possible n-obs	%	WORD-FINAL 16 Possible n-obs	%
a. Correct (C)	6	75.00	12	75.00
b. Distortions (C-)	0	0.00	1	6.25
c. Cluster Reduction (CR)	2	25.00	3	18.75
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 82 Possible n-obs	%	3+-SYLLABLE 3 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	7	8.54	0	0.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
MAR 19, '91

Child/Group 9P102 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 122 Possible n-obs	%		WORD-FINAL 78 Possible n-obs	%
a. Correct (C)		109	89.34		69	88.46
b. Distortions (C-)		0	0.00		2	2.56
c. Consonant Deletions	(ICD)	2	1.64	(FCD)	6	7.69
d. Assimilations	(RA)	1	0.82	(PA)	0	0.00
e. Uncoded (UC)		0	0.00		1	1.28
f. ICD + UC		2	1.64			
g. Uncoded by Rule (UC-)		1	0.82		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	9	0	0.00	5	0	0.00
2. Possible Occurrence	122	9	7.38	78	5	6.41
3. Obtained Occurrence (SCS)	122	0	0.00	78	0	0.00
b. Stopping (S)						
1. NPA Summary	38	8	21.05	31	0	0.00
2. Possible Occurrence	122	38	31.15	78	31	39.74
3. Obtained Occurrence (SCS)	122	8	6.56	78	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	1	0	0.00	1	0	0.00
2. Possible Occurrence	122	1	0.82	78	1	1.28
3. Obtained Occurrence (SCS)	122	0	0.00	78	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	3	1	33.33	5	0	0.00
2. Possible Occurrence	122	3	2.46	78	5	6.41
3. Obtained Occurrence (SCS)	122	1	0.82	78	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 3 Possible n-obs	%	WORD-FINAL 22 Possible n-obs	%
a. Correct (C)	3	100.00	11	50.00
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	0	0.00	11	50.00
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 50 Possible n-obs	%	3+-SYLLABLE 2 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	5	10.00	0	0.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P100
Study Identification
DOB
Age at Sampling Date

Sampling Date
Sampling Clinician
Transcription Date
Transcriber

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 160 Possible n-obs	%		WORD-FINAL 109 Possible n-obs	%
a. Correct (C)		152	95.00		80	73.39
b. Distortions (C-)		0	0.00		1	0.92
c. Consonant Deletions	(ICD)	1	0.62	(FCD)	27	24.77
d. Assimilations	(RA)	1	0.62	(PA)	0	0.00
e. Uncoded (UC)		0	0.00		1	0.92
f. ICD + UC		1	0.62			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	15	1	6.67	1	0	0.00
2. Possible Occurrence	160	15	9.37	109	1	0.92
3. Obtained Occurrence (SCS)	160	1	0.62	109	0	0.00
b. Stopping (S)						
1. NPA Summary	40	2	5.00	27	0	0.00
2. Possible Occurrence	160	40	25.00	109	27	24.77
3. Obtained Occurrence (SCS)	160	2	1.25	109	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	4	1	25.00	0	0	******
2. Possible Occurrence	160	4	2.50	109	0	0.00
3. Obtained Occurrence (SCS)	160	1	0.62	109	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	17	2	11.76	10	0	0.00
2. Possible Occurrence	160	17	10.62	109	10	9.17
3. Obtained Occurrence (SCS)	160	2	1.25	109	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 1 Possible n-obs	%	WORD-FINAL 8 Possible n-obs	%
a. Correct (C)	0	0.00	7	87.50
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	1	100.00	1	12.50
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 33 Possible n-obs	%	3+-SYLLABLE 5 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	4	12.12	1	20.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P086
Study Identification
DOB
Age at Sampling Date

Sampling Date
Sampling Clinician
Transcription Date
Transcriber

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 146 Possible n-obs	%		WORD-FINAL 103 Possible n-obs	%
a. Correct (C)		113	77.40		77	74.76
b. Distortions (C-)		0	0.00		2	1.94
c. Consonant Deletions	(ICD)	9	6.16	(FCD)	21	20.39
d. Assimilations	(RA)	1	0.68	(PA)	0	0.00
e. Uncoded (UC)		2	1.37		3	2.91
f. ICD + UC		11	7.53			
g. Uncoded by Rule (UC-)		1	0.68		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	9	1	11.11	9	0	0.00
2. Possible Occurrence	146	9	6.16	103	9	8.74
3. Obtained Occurrence (SCS)	146	1	0.68	103	0	0.00
b. Stopping (S)						
1. NPA Summary	47	19	40.43	41	0	0.00
2. Possible Occurrence	146	47	32.19	103	41	39.81
3. Obtained Occurrence (SCS)	146	19	13.01	103	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	0	0	******	0	0	******
2. Possible Occurrence	146	0	0.00	103	0	0.00
3. Obtained Occurrence (SCS)	146	0	0.00	103	0	0.00
l. Liquid Simplification (LS)						
1. NPA Summary	9	0	0.00	1	0	0.00
2. Possible Occurrence	146	9	6.16	103	1	0.97
3. Obtained Occurrence (SCS)	146	0	0.00	103	0	0.00

s

Possibility of Occurrence

	WORD-INITIAL 10 Possible n-obs	%	WORD-FINAL 37 Possible n-obs	%
orrect (C)	4	40.00	18	48.65
stortions (C-)	0	0.00	0	0.00
ister Reduction (CR)	6	60.00	18	48.65
oded (UC)	0	0.00	1	2.70

II. MULTISYLLABIC WORDS

d Clusters

bility of Occurrence

	2-SYLLABLE 49 Possible n-obs	%	3+-SYLLABLE 3 Possible n-obs	%
sed Syllable Deletion (USD)	6	12.24	0	0.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
MAR 19, '91

Child/Group 9P053
Study Identification
DOB
Age at Sampling Date

Sampling Date
Sampling Clinician
Transcription Date
Transcriber

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 149 Possible n-obs	%		WORD-FINAL 110 Possible n-obs	%
a. Correct (C)		105	70.47		105	95.45
b. Distortions (C-)		0	0.00		2	1.82
c. Consonant Deletions	(ICD)	18	12.08	(FCD)	1	0.91
d. Assimilations	(RA)	1	0.67	(FA)	0	0.00
e. Uncoded (UC)		1	0.67		1	0.91
f. ICD + UC		19	12.75			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	18	0	0.00	3	0	0.00
2. Possible Occurrence	149	18	12.08	110	3	2.73
3. Obtained Occurrence (SCS)	149	0	0.00	110	0	0.00
b. Stopping (S)						
1. NPA Summary	56	24	42.86	33	1	3.03
2. Possible Occurrence	149	56	37.58	110	33	30.00
3. Obtained Occurrence (SCS)	149	24	16.11	110	1	0.91
c. Palatal Fronting (PF)						
1. NPA Summary	1	0	0.00	0	0	******
2. Possible Occurrence	149	1	0.67	110	0	0.00
3. Obtained Occurrence (SCS)	149	0	0.00	110	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	17	0	0.00	2	0	0.00
2. Possible Occurrence	149	17	11.41	110	2	1.82
3. Obtained Occurrence (SCS)	149	0	0.00	110	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 7 Possible n-obs	%	WORD-FINAL 19 Possible n-obs	%
a. Correct (C)	1	14.29	8	42.11
b. Distortions (C-)	0	0.00	1	5.26
c. Cluster Reduction (CR)	6	85.71	10	52.63
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 49 Possible n-obs	%	3+-SYLLABLE 2 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	1	2.04	0	0.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P041 _____ Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 234 Possible n-obs	%		WORD-FINAL 160 Possible n-obs	%
a. Correct (C)		223	95.30		147	91.87
b. Distortions (C-)		0	0.00		4	2.50
c. Consonant Deletions	(ICD)	2	0.85	(FCD)	7	4.37
d. Assimilations	(RA)	0	0.00	(PA)	1	0.62
e. Uncoded (UC)		1	0.43		1	0.62
f. ICD + UC		3	1.28			
g. Uncoded by Rule (UC-)		1	0.43		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	10	0	0.00	6	0	0.00
2. Possible Occurrence	234	10	4.27	160	6	3.75
3. Obtained Occurrence (SCS)	234	0	0.00	160	0	0.00
b. Stopping (S)						
1. NPA Summary	102	7	6.86	69	0	0.00
2. Possible Occurrence	234	102	43.59	160	69	43.12
3. Obtained Occurrence (SCS)	234	7	2.99	160	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	1	0	0.00	1	0	0.00
2. Possible Occurrence	234	1	0.43	160	1	0.62
3. Obtained Occurrence (SCS)	234	0	0.00	160	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	17	0	0.00	3	0	0.00
2. Possible Occurrence	234	17	7.26	160	3	1.87
3. Obtained Occurrence (SCS)	234	0	0.00	160	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 6 Possible n-obs	%	WORD-FINAL 56 Possible n-obs	%
a. Correct (C)	6	100.00	44	78.57
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	0	0.00	12	21.43
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 107 Possible n-obs	%	3+-SYLLABLE 7 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	3	2.80	1	14.29

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P007 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 138 Possible n-obs	%		WORD-FINAL 104 Possible n-obs	%
a. Correct (C)		129	93.48		101	97.12
b. Distortions (C-)		0	0.00		0	0.00
c. Consonant Deletions	(ICD)	2	1.45	(FCD)	2	1.92
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		1	0.72		0	0.00
f. ICD + UC		3	2.17			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	16	0	0.00	6	0	0.00
2. Possible Occurrence	138	16	11.59	104	6	5.77
3. Obtained Occurrence (SCS)	138	0	0.00	104	0	0.00
b. Stopping (S)						
1. NPA Summary	44	6	13.64	27	1	3.70
2. Possible Occurrence	138	44	31.88	104	27	25.96
3. Obtained Occurrence (SCS)	138	6	4.35	104	1	0.96
c. Palatal Fronting (PF)						
1. NPA Summary	5	0	0.00	0	0	******
2. Possible Occurrence	138	5	3.62	104	0	0.00
3. Obtained Occurrence (SCS)	138	0	0.00	104	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	6	0	0.00	8	0	0.00
2. Possible Occurrence	138	6	4.35	104	8	7.69
3. Obtained Occurrence (SCS)	138	0	0.00	104	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 5 Possible n-obs	%	WORD-FINAL 27 Possible n-obs	%
a. Correct (C)	5	100.00	20	74.07
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	0	0.00	7	25.93
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 38 Possible n-obs	%	3+-SYLLABLE 10 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	7	18.42	1	10.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P006 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 176 Possible n-obs	%		WORD-FINAL 168 Possible n-obs	%
a. Correct (C)		169	96.02		160	95.24
b. Distortions (C-)		0	0.00		1	0.60
c. Consonant Deletions	(ICD)	0	0.00	(FCD)	4	2.38
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		1	0.57		2	1.19
f. ICD + UC		1	0.57			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	20	0	0.00	13	0	0.00
2. Possible Occurrence	176	20	11.36	168	13	7.74
3. Obtained Occurrence (SCS)	176	0	0.00	168	0	0.00
b. Stopping (S)						
1. NPA Summary	38	5	13.16	54	1	1.85
2. Possible Occurrence	176	38	21.59	168	54	32.14
3. Obtained Occurrence (SCS)	176	5	2.84	168	1	0.60
c. Palatal Fronting (PF)						
1. NPA Summary	6	0	0.00	3	0	0.00
2. Possible Occurrence	176	6	3.41	168	3	1.79
3. Obtained Occurrence (SCS)	176	0	0.00	168	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	9	1	11.11	19	0	0.00
2. Possible Occurrence	176	9	5.11	168	19	11.31
3. Obtained Occurrence (SCS)	176	1	0.57	168	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 6 Possible n-obs	%	WORD-FINAL 31 Possible n-obs	%
a. Correct (C)	6	100.00	27	87.10
b. Distortions (C-)	0	0.00	1	3.23
c. Cluster Reduction (CR)	0	0.00	3	9.68
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 54 Possible n-obs	%	3+-SYLLABLE 7 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	1	1.85	1	14.29

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9P144 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 175 Possible n-obs	%		WORD-FINAL 119 Possible n-obs	%
a. Correct (C)		173	98.86		105	88.24
b. Distortions (C-)		0	0.00		6	5.04
c. Consonant Deletions	(ICD)	2	1.14	(FCD)	8	6.72
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		0	0.00		0	0.00
f. ICD + UC		2	1.14			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	17	0	0.00	6	0	0.00
2. Possible Occurrence	175	17	9.71	119	6	5.04
3. Obtained Occurrence (SCS)	175	0	0.00	119	0	0.00
b. Stopping (S)						
1. NPA Summary	70	0	0.00	45	0	0.00
2. Possible Occurrence	175	70	40.00	119	45	37.82
3. Obtained Occurrence (SCS)	175	0	0.00	119	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	6	0	0.00	0	0	******
2. Possible Occurrence	175	6	3.43	119	0	0.00
3. Obtained Occurrence (SCS)	175	0	0.00	119	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	7	0	0.00	4	0	0.00
2. Possible Occurrence	175	7	4.00	119	4	3.36
3. Obtained Occurrence (SCS)	175	0	0.00	119	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 8 Possible n-obs	%	WORD-FINAL 36 Possible n-obs	%
a. Correct (C)	8	100.00	30	83.33
b. Distortions (C-)	0	0.00	1	2.78
c. Cluster Reduction (CR)	0	0.00	5	13.89
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 36 Possible n-obs	%	3+-SYLLABLE 5 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	4	11.11	1	20.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9LS.141 Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 164 Possible n-obs	%		WORD-FINAL 102 Possible n-obs	%
a. Correct (C)		144	87.80		89	87.25
b. Distortions (C-)		3	1.83		2	1.96
c. Consonant Deletions	(ICD)	0	0.00	(FCD)	7	6.86
d. Assimilations	(RA)	0	0.00	(PA)	2	1.96
e. Uncoded (UC)		2	1.22		1	0.98
f. ICD + UC		2	1.22			
g. Uncoded by Rule (UC-)		1	0.61		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	20	0	0.00	8	0	0.00
2. Possible Occurrence	164	20	12.20	102	8	7.84
3. Obtained Occurrence (SCS)	164	0	0.00	102	0	0.00
b. Stopping (S)						
1. NPA Summary	67	12	17.91	30	1	3.33
2. Possible Occurrence	164	67	40.85	102	30	29.41
3. Obtained Occurrence (SCS)	164	12	7.32	102	1	0.98
c. Palatal Fronting (PF)						
1. NPA Summary	6	2	33.33	2	0	0.00
2. Possible Occurrence	164	6	3.66	102	2	1.96
3. Obtained Occurrence (SCS)	164	2	1.22	102	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	6	0	0.00	4	0	0.00
2. Possible Occurrence	164	6	3.66	102	4	3.92
3. Obtained Occurrence (SCS)	164	0	0.00	102	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 1 Possible n-obs	%	WORD-FINAL 41 Possible n-obs	%
a. Correct (C)	1	100.00	29	70.73
b. Distortions (C-)	0	0.00	2	4.88
c. Cluster Reduction (CR)	0	0.00	10	24.39
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 50 Possible n-obs	%	3+-SYLLABLE 5 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	1	2.00	0	0.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9LS.139 _____ Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 151 Possible n-obs	%		WORD-FINAL 92 Possible n-obs	%
a. Correct (C)		128	84.77		86	93.48
b. Distortions (C-)		0	0.00		2	2.17
c. Consonant Deletions	(ICD)	0	0.00	(FCD)	4	4.35
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		0	0.00		0	0.00
f. ICD + UC		0	0.00			
g. Uncoded by Rule (UC-)		3	1.99		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	12	0	0.00	8	0	0.00
2. Possible Occurrence	151	12	7.95	92	8	8.70
3. Obtained Occurrence (SCS)	151	0	0.00	92	0	0.00
b. Stopping (S)						
1. NPA Summary	42	13	30.95	38	0	0.00
2. Possible Occurrence	151	42	27.81	92	38	41.30
3. Obtained Occurrence (SCS)	151	13	8.61	92	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	3	1	33.33	0	0	******
2. Possible Occurrence	151	3	1.99	92	0	0.00
3. Obtained Occurrence (SCS)	151	1	0.66	92	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	11	6	54.55	2	0	0.00
2. Possible Occurrence	151	11	7.28	92	2	2.17
3. Obtained Occurrence (SCS)	151	6	3.97	92	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 3 Possible n-obs	%	WORD-FINAL 34 Possible n-obs	%
a. Correct (C)	2	66.67	25	73.53
b. Distortions (C-)	0	0.00	2	5.88
c. Cluster Reduction (CR)	1	33.33	7	20.59
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 29 Possible n-obs	%	3+-SYLLABLE 5 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	1	3.45	1	20.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
MAR 19, '91

Child/Group 9P133
Study Identification
DOB
Age at Sampling Date

Sampling Date
Sampling Clinician
Transcription Date
Transcriber

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 165 Possible n-obs	%		WORD-FINAL 120 Possible n-obs	%
a. Correct (C)		158	95.76		115	95.83
b. Distortions (C-)		0	0.00		0	0.00
c. Consonant Deletions	(ICD)	2	1.21	(FCD)	1	0.83
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		0	0.00		4	3.33
f. ICD + UC		2	1.21			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	17	0	0.00	9	0	0.00
2. Possible Occurrence	165	17	10.30	120	9	7.50
3. Obtained Occurrence (SCS)	165	0	0.00	120	0	0.00
b. Stopping (S)						
1. NPA Summary	63	5	7.94	47	0	0.00
2. Possible Occurrence	165	63	38.18	120	47	39.17
3. Obtained Occurrence (SCS)	165	5	3.03	120	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	4	0	0.00	3	0	0.00
2. Possible Occurrence	165	4	2.42	120	3	2.50
3. Obtained Occurrence (SCS)	165	0	0.00	120	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	9	0	0.00	1	0	0.00
2. Possible Occurrence	165	9	5.45	120	1	0.83
3. Obtained Occurrence (SCS)	165	0	0.00	120	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 8 Possible n-obs	%	WORD-FINAL 37 Possible n-obs	%
a. Correct (C)	8	100.00	35	94.59
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	0	0.00	2	5.41
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 78 Possible n-obs	%	3+-SYLLABLE 6 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	3	3.85	2	33.33

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9LS.078 _____ Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 100 Possible n-obs	%		WORD-FINAL 93 Possible n-obs	%
a. Correct (C)		96	96.00		82	88.17
b. Distortions (C-)		1	1.00		3	3.23
c. Consonant Deletions	(ICD)	1	1.00	(FCD)	6	6.45
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		0	0.00		1	1.08
f. ICD + UC		1	1.00			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	8	0	0.00	8	0	0.00
2. Possible Occurrence	100	8	8.00	93	8	8.60
3. Obtained Occurrence (SCS)	100	0	0.00	93	0	0.00
b. Stopping (S)						
1. NPA Summary	35	1	2.86	42	1	2.38
2. Possible Occurrence	100	35	35.00	93	42	45.16
3. Obtained Occurrence (SCS)	100	1	1.00	93	1	1.08
c. Palatal Fronting (PF)						
1. NPA Summary	0	0	******	3	0	0.00
2. Possible Occurrence	100	0	0.00	93	3	3.23
3. Obtained Occurrence (SCS)	100	0	0.00	93	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	5	1	20.00	1	0	0.00
2. Possible Occurrence	100	5	5.00	93	1	1.08
3. Obtained Occurrence (SCS)	100	1	1.00	93	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 7 Possible n-obs	%	WORD-FINAL 14 Possible n-obs	%
a. Correct (C)	7	100.00	8	57.14
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	0	0.00	6	42.86
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 60 Possible n-obs	%	3+-SYLLABLE 3 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	5	8.33	0	0.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
MAR 19, '91

Child/Group 9P059 _____ Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 165 Possible n-obs	%		WORD-FINAL 142 Possible n-obs	%
a. Correct (C)		160	96.97		140	98.59
b. Distortions (C-)		0	0.00		0	0.00
c. Consonant Deletions	(ICD)	0	0.00	(FCD)	1	0.70
d. Assimilations	(A)	1	0.61	(PA)	0	0.00
e. Uncoded (UC)		2	1.21		1	0.70
f. ICD + UC		2	1.21			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	15	0	0.00	5	0	0.00
2. Possible Occurrence	165	15	9.09	142	5	3.52
3. Obtained Occurrence (SCS)	165	0	0.00	142	0	0.00
b. Stopping (S)						
1. NPA Summary	52	2	3.85	32	0	0.00
2. Possible Occurrence	165	52	31.52	142	32	22.54
3. Obtained Occurrence (SCS)	165	2	1.21	142	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	4	0	0.00	1	0	0.00
2. Possible Occurrence	165	4	2.42	142	1	0.70
3. Obtained Occurrence (SCS)	165	0	0.00	142	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	18	0	0.00	17	0	0.00
2. Possible Occurrence	165	18	10.91	142	17	11.97
3. Obtained Occurrence (SCS)	165	0	0.00	142	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 12 Possible n-obs	%	WORD-FINAL 26 Possible n-obs	%
a. Correct (C)	12	100.00	25	96.15
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	0	0.00	1	3.85
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 54 Possible n-obs	%	3+-SYLLABLE 0 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	0	0.00	0	******

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9LS.050 _____ Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 143 Possible n-obs	%		WORD-FINAL 98 Possible n-obs	%
a. Correct (C)		136	95.10		94	95.92
b. Distortions (C-)		0	0.00		0	0.00
c. Consonant Deletions	(ICD)	2	1.40	(FCD)	2	2.04
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		0	0.00		2	2.04
f. ICD + UC		2	1.40			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	16	0	0.00	6	0	0.00
2. Possible Occurrence	143	16	11.19	98	6	6.12
3. Obtained Occurrence (SCS)	143	0	0.00	98	0	0.00
b. Stopping (S)						
1. NPA Summary	56	4	7.14	32	0	0.00
2. Possible Occurrence	143	56	39.16	98	32	32.65
3. Obtained Occurrence (SCS)	143	4	2.80	98	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	3	0	0.00	2	0	0.00
2. Possible Occurrence	143	3	2.10	98	2	2.04
3. Obtained Occurrence (SCS)	143	0	0.00	98	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	4	1	25.00	5	0	0.00
2. Possible Occurrence	143	4	2.80	98	5	5.10
3. Obtained Occurrence (SCS)	143	1	0.70	98	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 13 Possible n-obs	%	WORD-FINAL 26 Possible n-obs	%
a. Correct (C)	12	92.31	19	73.08
b. Distortions (C-)	0	0.00	2	7.69
c. Cluster Reduction (CR)	1	7.69	5	19.23
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 66 Possible n-obs	%	3+-SYLLABLE 2 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	3	4.55	0	0.00

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9LS.040
Study Identification _____
DOB _____
Age at Sampling Date _____

Sampling Date _____
Sampling Clinician _____
Transcription Date _____
Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 147 Possible n-obs	%		WORD-FINAL 109 Possible n-obs	%
a. Correct (C)		141	95.92		104	95.41
b. Distortions (C-)		0	0.00		0	0.00
c. Consonant Deletions	(ICD)	2	1.36	(FCD)	2	1.83
d. Assimilations	(RA)	0	0.00	(PA)	0	0.00
e. Uncoded (UC)		4	2.72		3	2.75
f. ICD + UC		6	4.08			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	15	0	0.00	3	0	0.00
2. Possible Occurrence	147	15	10.20	109	3	2.75
3. Obtained Occurrence (SCS)	147	0	0.00	109	0	0.00
b. Stopping (S)						
1. NPA Summary	66	0	0.00	37	0	0.00
2. Possible Occurrence	147	66	44.90	109	37	33.94
3. Obtained Occurrence (SCS)	147	0	0.00	109	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	10	0	0.00	2	0	0.00
2. Possible Occurrence	147	10	6.80	109	2	1.83
3. Obtained Occurrence (SCS)	147	0	0.00	109	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	8	0	0.00	5	0	0.00
2. Possible Occurrence	147	8	5.44	109	5	4.59
3. Obtained Occurrence (SCS)	147	0	0.00	109	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 6 Possible n-obs	%	WORD-FINAL 20 Possible n-obs	%
a. Correct (C)	5	83.33	18	90.00
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	1	16.67	1	5.00
d. Uncoded (UC)	0	0.00	1	5.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 44 Possible n-obs	%	3+-SYLLABLE 6 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	2	4.55	1	16.67

PERCENTAGE OCCURRENCE SUMMARY (POS): All Words
FEB 25, '91

Child/Group 9LS.036 _____ Sampling Date _____
Study Identification _____ Sampling Clinician _____
DOB _____ Transcription Date _____
Age at Sampling Date _____ Transcriber _____

I. MONOSYLLABIC WORDS

A. Singletons

1. 100% Possibility of Occurrence

		WORD-INITIAL 141 Possible n-obs	%		WORD-FINAL 100 Possible n-obs	%
a. Correct (C)		140	99.29		92	92.00
b. Distortions (C-)		0	0.00		2	2.00
c. Consonant Deletions	(ICD)	0	0.00	(FCD)	2	2.00
d. Assimilations	(RA)	1	0.71	(PA)	2	2.00
e. Uncoded (UC)		0	0.00		2	2.00
f. ICD + UC		0	0.00			
g. Uncoded by Rule (UC-)		0	0.00		0	0.00

2. Less Than 100% Possibility of Occurrence

	WORD-INITIAL n-pos	n-obs	%	WORD-FINAL n-pos	n-obs	%
a. Velar Fronting (VF)						
1. NPA Summary	6	0	0.00	10	0	0.00
2. Possible Occurrence	141	6	4.26	100	10	10.00
3. Obtained Occurrence (SCS)	141	0	0.00	100	0	0.00
b. Stopping (S)						
1. NPA Summary	32	0	0.00	36	0	0.00
2. Possible Occurrence	141	32	22.70	100	36	36.00
3. Obtained Occurrence (SCS)	141	0	0.00	100	0	0.00
c. Palatal Fronting (PF)						
1. NPA Summary	3	0	0.00	0	0	******
2. Possible Occurrence	141	3	2.13	100	0	0.00
3. Obtained Occurrence (SCS)	141	0	0.00	100	0	0.00
d. Liquid Simplification (LS)						
1. NPA Summary	13	0	0.00	5	0	0.00
2. Possible Occurrence	141	13	9.22	100	5	5.00
3. Obtained Occurrence (SCS)	141	0	0.00	100	0	0.00

B. Clusters

1. 100% Possibility of Occurrence

	WORD-INITIAL 7 Possible n-obs	%	WORD-FINAL 30 Possible n-obs	%
a. Correct (C)	7	100.00	28	93.33
b. Distortions (C-)	0	0.00	0	0.00
c. Cluster Reduction (CR)	0	0.00	2	6.67
d. Uncoded (UC)	0	0.00	0	0.00

II. MULTISYLLABIC WORDS

A. Singletons and Clusters

1. 100% Possibility of Occurrence

	2-SYLLABLE 40 Possible n-obs	%	3+-SYLLABLE 9 Possible n-obs	%
a. Unstressed Syllable Deletion (USD)	1	2.50	4	44.44